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VOLUME SIX

NEW YORK

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The National Encyclopedia

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METHOD OF CROSS REFERENCES

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The National Encyclopedia

JOHN J MINIMUM

JOHN, ST., son of Zebedee, was one of the first of the twelve disciples of Jesus, and with Peter (*see* PETER, SAINT) Andrew (*see* ANDREW, SAINT) and his own brother James (*see* JAMES THE ELDER), was in the closest intimacy with his master. He was born about 4 A.D., was a fisherman, and was one of the pillars of the church in Jerusalem. In the Gospels he is presented to us in two characters: first, with his brother James as one of the "sons of thunder," and secondly, as "the disciple whom Jesus loved," to whom at the



ST. JOHN
After an engraving by the German master, "E. S."

crucifixion Jesus committed the care of his mother, Mary, whom John took "to his own home." Five of the books of the New Testament are ascribed to him: the fourth Gospel, three short Epistles, and the Book of Revelation, although many modern students have reasoned that they are all the works of other and later authors. Some hold that there were two Johns: the apostle, and "the Elder," who became the bishop of Ephesus. Since the time of Irenaeus, the Apostle is believed to have been the head of the Ephesian church; but other early writers mention only Paul in connection with that Church. Many legends have attached to John, the best known being that related by Tertullian, that during the reign of Domitian he was imprisoned, was compelled to drink poison, was plunged into a cauldron of boiling oil, but received no injury, and that after an exile on the island of Patmos, he went to Ephesus in the reign of Nerva, and died there at 100 years of age.



THE EAGLE OF ST. JOHN, THE SYMBOL IN ART OF THAT SAINT
From an engraving by Martin Schongauer

JOHN, ST., THE BAPTIST. *See* JOHN THE BAPTIST.

JOHN, name of 22 popes and an antipope. St. John I, 523-526, was sent by Theodoric on an unsuccessful mission to Constantinople. He died in prison after his return, and was canonized. John II, 532-535, combated heresies. John III, 561-574. John IV, 640-642, held a council to eliminate heresy. John V, 685-686. John VI, 701-705. John VII, 705-707. John VIII, 872-882, negotiated with Charles the Fat in regard to the imperial succession and established the precedent that the imperial crown is the gift of the Roman pontiff. He crowned Charles the Fat. John IX, 898-900, a Benedictine. John X, 914-928, was elevated to the papacy by the notorious Theodora. At the command of Theodora's daughter, Marozia, he was imprisoned in 928 and died in 929. John XI, 931-936, son of Marozia and Pope Sergius III, became pope at the age of 21 but was imprisoned by his brother, the ruler of Rome, in 933. John XII, 955-964, nephew of the former, seized the tiara at the age of 18. He was the first pope to change his name at his coronation. He called on Otto the Great to protect him from King Berengar and crowned Otto emperor; but the latter deposed him. John XIII, 965-972, was made pope by Otto the Great. John

XIV, 983-984, was made pope by Otto II. John XV, 985-996, was aided by Emperor Otto III and performed the first papal canonization. John XVI, 997-998, was raised to the papal chair upon the banishment of Gregory V, deposed by Otto III and mutilated, though he seems to have lived till 1013. John XVII became pope June 1003, but died within 6 months. John XVIII, 1003-1009, was led by the Crescentius family. John XIX, 1024-33, brother of his predecessor Benedict VIII, became pope by bribery. He crowned Conrad II and was dependent on him. John XXI, 1276-77, should have been numbered John XX; but there was confusion regarding a second John XV supposed to have reigned four months as successor to Boniface VII, but later declared mythical, and in the attempt to clear this up XX was omitted. John XXI, before he became pope, translated into Latin several works of Aristotle, which had great influence on medieval thought. John XXII, 1316-34, a French prelate of high spirit and inflexible will, who meddled in worldly matters to the advantage of France. By the exploitation of ecclesiastical rights, he amassed a considerable sum. John XXIII, 1410-17, generally considered an antipope, an Italian military prelate of doubtful character alleged to have poisoned his predecessor, Alexander V. He promised to resign the tiara, if Gregory XII and Benedict XIII did the same, but withdrew his abdication and was deposed. He was imprisoned in various castles, but bought his freedom in 1418, was pardoned by Martin V and became once more cardinal archbishop.

JOHN (1167-1216), King of England, surnamed Lackland, born Dec. 24, 1167, at Oxford. He was the youngest son of Henry II. His early life was spent in shifty attempts to assure his succession to the throne upon the death of his brother Richard. In this he was successful, being crowned in 1199, despite the opposition of his continental vassals who supported Arthur, son of John's elder brother Geoffrey. The ensuing war ended only when John captured Arthur and murdered him. This dispute over the succession and a quarrel with one of his continental vassals brought John into trouble with King Philip of France, and ultimately lost him a large share of his continental possessions, including Normandy, Maine, and Anjou. Only Aquitaine remained to him. Almost immediately thereafter he became embroiled with his clergy and the papacy over the choice of an archbishop of Canterbury. In 1208 England was placed under an Interdict and some time later a decree of excommunication was promulgated against the king. John's reply was confiscation of church property and rents. In the end he succeeded in incurring the enmity of his barons and was constrained to make his peace with the church, 1213, receiving the Pope's appointee, Stephen Langton, into the see of Canterbury. At the same time he recognized the suzerainty of the Pope and paid 1,000 marks annual tribute to the Holy See. His troubles with the barons only increased, however, and on June 15, 1215 he was forced by them to sign the MAGNA CARTA which bound him henceforth to maintain his feudal contract. The remaining year of his life he spent in futile efforts to secure the Pope and the king of France as allies to assist him in regaining the ascendancy over his barons.

John was not such a weakling as he has sometimes been painted, but he possessed an unbridled temper, was cruel, and was lacking in a sense of dignity. England was on the whole prosperous during his reign. His quarrels with barons, clergy and the French king left him chronically impecunious, a situation which redounded to the benefit of the growing towns which were thus enabled to purchase from him charters guaranteeing them a considerable measure of autonomy.

JOHN II, THE GOOD (1319-64), king of France, was born in 1319. After his ascension to the throne in 1350, he was noted for his incompetence. He was captured by the Black Prince at Poitiers in 1356 and taken to London. The PEACE OF BRÉTIGNY, 1360, placed his ransom at 3,000,000 crowns and John made a desperate effort to raise this sum but none of his efforts were fruitful. He died in England, Apr. 8, 1364.

JOHN, EPISTLES OF, in the New Testament, consist of three brief letters, ascribed from the earliest times to the Apostle John, to whom was also credited the authorship of the fourth Gospel and the Apocalypse. Not only the years immediately preceding the destruction of Jerusalem, but also 95 A.D. have been suggested as their dates. Because the second and third letters are written by one who calls himself the Elder, instead of the Disciple or the Apostle, many think that their authorship is open to question, and even would attribute the first letter to another, because the vocabulary and ideas contradict the fourth Gospel. The belief persists, however, that no explanation is so satisfactory as the early one, which ascribed the epistles to John "the beloved disciple." Uppermost in these short letters is the theme of brotherly love, with counsels on the conflict of truth with falsehood and warnings against backsliding and false teachers. The two last letters are addressed to individuals, to "the elect lady" and to his "dear friend Gaius," but nothing is known about these persons.

JOHN, GOSPEL OF ST., the fourth Gospel of the New Testament, has less in common with the other three Gospels than they have with each other. Its authorship has been traditionally ascribed to John, the "beloved disciple," and many students still hold that he was the author. The preponderating tendency, however, is to ascribe it to a writer well-versed in Hellenism and too profound in his philosophy ever to have been a simple fisherman of the Sea of Galilee. Most scholars place its date variously between 80 and 110 A.D.

The purpose of the book is avowedly to set forth the life of Jesus as both the Messiah and the Son of God. To this end the author opens with his *logos* doctrine as to the personality of the Christ. His story of Jesus differs widely from the stories of the other Gospels. Their accounts are of a one-year ministry;

John's, of a ministry of at least three years. John's portrait of Jesus is not that of a simple Galilean teacher, but of a personage of mystery, transcending human nature. Assuming the total number of features to be 100, Matthew has 42 peculiar to himself, and 58 concordances with the other Gospels; Mark has 7 peculiar and 93 concordances; Luke has 59 peculiar and 41 concordances, but John has 92 peculiarities and only 8 concordances. These differences, however, can be accepted as supplementary more than contradictory. Whatever view of the book is accepted, it has had a profound influence on Christian life and doctrine. It lies at the heart of the Church's conception of a divine Christ, and the gospel's pictures of "the Light of the World," "the only begotten son," "the Way, the Truth and the Life," could hardly be spared from orthodox Christianity.

JOHN BROWN'S RAID, Oct. 16, 1859, the seizure of a Federal arsenal at Harper's Ferry, W. Va., by John Brown with 18 men as the first step in Brown's plan for establishing in the Virginia mountains a fortified haven for fugitive slaves. John Brown, radical abolitionist and eccentric, had become well known for his murderous retaliatory warfare against the KANSAS BORDER RAIDERS. In his plans to seize the arsenal at Harper's Ferry to secure arms and ammunition for fugitive slaves he was aided by several abolitionist leaders. The arsenal was easily captured, and 60 citizens of Harper's Ferry confined as hostages. When a detachment of U.S. Marines under Col. Robert E. Lee arrived to aid local volunteer fighters, Brown's little band was overpowered, and Brown himself seriously wounded after he had surrendered. Brown was arraigned for treason, and executed on Dec. 2, 1859. The South was excited and embittered by the raid, assuming it to have the sanction and connivance of northern leaders. Abolitionists regarded Brown's execution as martyrdom.

JOHN B. STETSON UNIVERSITY, at De Land, Fla., a coeducational institution founded in 1887 under the auspices of the Baptist denomination. Originally called De Land University, it received its present name in 1889 in honor of John Batterson Stetson, its benefactor. The productive funds in 1931 were $979,616. The library contained 34,230 volumes. In 1930 there were 452 students, and a faculty of 45 headed by Pres. Lincoln Hulley.

JOHN BULL, the nickname of the English people. It was Dr. John Arbuthnot, in his *History of John Bull,* 1727, who definitely fixed the character of this great personification: "an honest, plain-dealing fellow, choleric, bold, and of a very inconstant temper." *John Bull* is the title of a comedy, also called *The Englishman's Fireside,* 1805, by George Coleman.

JOHN F. SLATER FUND, a foundation established in 1882 by John F. Slater for the promotion of industrial education of Negroes in the southern states. To Slater's original gift of $1,000,000, the PEABODY EDUCATIONAL FUND added $325,000 in 1914. The income only is available. The fund has cooperated in establishing and supporting public county training schools in the South, these numbering 385 in 1930. It is also aiding colleges in the payment of salaries, paying during the session 1929-30 all or a part of the salary of a teacher in English or science in 34 colleges.

JOHN GILPIN, the London draper bent on a holiday whom WILLIAM COWPER pictures in his poem of that name. Unable to get himself and all his family into a coach, Gilpin decides to ride. He is no horseman, however, and the horse races to the house of the friend from whom Gilpin borrowed him. On the return the horse merely takes Gilpin back to his own house. The story seems to be based on such an adventure of a Mr. Breyer late in the 18th century.

JOHN OF AUSTRIA or **DON JUAN DE AUSTRIA** (1545-78), a celebrated Spanish general, the illegitimate son of the emperor Charles V, was born Feb. 24, 1545 at Ratisbon (Regensburg), Bavaria. He was acknowledged by his half-brother Philip II of Spain after his father's death. In 1570 Don Juan crushed the Moriscos of Granada and in 1571 defeated the Turks in a great sea battle off Lepanto, following up the victory by the conquest of Tunis. He was made viceroy of the Netherlands in 1576 but failed to pacify the rebellious northern provinces under William of Orange. He died at Namur, Belgium, Oct. 1, 1578.

JOHN OF BEVERLEY, ST., English bishop of York, was born probably at Harpham in Yorkshire at an unknown date in the seventh century. One of his pupils was the Venerable Bede. St. John was successively bishop of Hexham (687), and bishop of York (705). In 718 he founded the monastery at Beverley, where he died on May 7, 721. He was canonized in 1037 by Benedict IX. His feast day is May 7. John of Beverley is regarded as the patron saint of those afflicted with deafness or dumbness.

JOHN OF GAUNT (1340-99), Duke of Lancaster, the fourth son of Edward III, founder of the House of LANCASTER and a line of English kings, was born at Ghent in Mar. 1340. He later assumed the title of King of Castile. During the last years of EDWARD III of England, John of Gaunt became the most influential figure in English politics. The act which made him famous was his defense of the religious reformer, WYCLIFFE. John of Gaunt died at Ely House, Holburn, on Feb. 3, 1399.

JOHN OF THE CROSS, ST. (1542-91), Spanish mystic and poet, was born near Avila in Spain on June 24, 1542. He entered the Carmelite Order in 1563 and was ordained priest four years later. Having come under the influence of St. Teresa, he founded the Institute of Bare-Footed Carmelites and suffered persecution because of his reforming zeal. His mystical writings and poems are justly admired and studied. The most important of these works are *The Ascent of Mount Carmel; The Dark Night of the Soul; The Spiritual Canticle; The Living Flame.* St. John of the Cross died obscurely either in 1591 or in 1605, the authorities being at variance on this point. He was canonized in 1726 and his day is kept on Nov. 24.

JOHNS HOPKINS UNIVERSITY, a semi-coeducational university at Baltimore, Md., especially noted for its Graduate School of Medicine. It was founded in 1876 under the will of a local merchant, Johns Hopkins, which bequeathed $7,000,000 for the establishment of a university and a hospital. The hospital was opened in 1889. True to the founder's request, the hospital has formed a part of the Medical School, and the professorships of medicine, surgery and obstetrics have been held respectively by the hospital's physician, surgeon and gynecologist. The university also includes a College of Arts and Sciences, Graduate School of Philosophy, School of Hygiene and Public Health, School of Engineering, College for Teachers, School of Business Economics, Summer School, Evening Courses and University Extension. The Graduate Medical School, generally considered the foremost in the United States, has had such outstanding teachers as Sir WILLIAM OSLER, who taught between 1889 and 1904, and WILLIAM H. WELCH (1850-). Exceptionally well-equipped with laboratories and clinics, it is preeminently noted for research. Of its special clinics and laboratories the most notable are: the Hunterian, the Pathological, Harriet Lane Home for Pediatrics, Brady Urological Institute, Women's Clinic for Obstetrics, Wilmer Ophthalmological Institute, Phipps Psychiatric Clinic, the Laboratory of Plant Physiology, and the Institute of Biological Research. The productive funds in 1931 were $28,873,945. The library contained over 300,000 volumes. The student enrollment in 1931 was 4,486 and the teaching staff of approximately 700 was headed by Pres. JOSEPH S. AMES.

JOHNSON, ALLEN (1870-1931), American historian and educator, was born at Lowell, Mass., Jan. 29, 1870. He was educated at Amherst, Leipzig and Paris. He began his career as a teacher of history at Lawrenceville School, N.J., later proceeding to Iowa College, now Grinnell College, and from there to Bowdoin College. From 1910-26 he was Larned professor of American History at Yale. In 1916 Johnson became editor of the monumental *Chronicles of America,* for which he wrote one of the 50 volumes, *Jefferson and his Colleagues.* His sound scholarship and editorial skill won him universal recognition, and in 1925 he was chosen editor of the *Dictionary of American Biography,* which position he held at the time of his death. Johnson possessed the rare ability of animating history and biography without sacrificing accuracy. Among his historical works were *Union and Democracy* and *The Historian and Historical Evidence.* He also wrote a *Life of Stephen A. Douglas.* He died in Washington Jan. 18, 1931.

JOHNSON, ALVIN SAUNDERS (1874-), American economist and author, was born near Homer, Neb., Dec. 18, 1874. He received his A.B. degree from the University of Nebraska in 1897, his A.M. the next year, and his Ph.D. from Columbia University in 1902. From 1902 to 1906 Johnson taught economics at Columbia, and in following years at the universities of Nebraska, Texas, Chicago, and at Stanford and Cornell. In 1923 he became a director of the New School for Social Research and, four years later, associate editor of the *Encyclopedia of the Social Sciences.* He is the author of *Rent in Modern Economic Theory* and *John Stuyvesant, Ancestor.*

JOHNSON, ANDREW (1808-75), 17th President of the United States, was born at Raleigh, N.C., Dec. 29, 1808, the son of Jacob Johnson, a city constable, and Mary M'Donough Johnson, both of English descent. His parents were poor, and from his early childhood Andrew harbored resentment against the wealthy slave-owning class. Jacob Johnson died when Andrew was five years old and 5 years later the boy became a tailor's apprentice. Lacking any formal education, he taught himself to read and write in his spare hours. He left Raleigh in 1826, and settled at Greeneville, Tenn., where in 1827 he married Eliza McCardle (d. 1876). She being well educated completed Johnson's training in rudimentary subjects. He earned a livelihood as a tailor until 1829, when he organized a "Working-men's Party" to run against the wealthy element in Greeneville in city elections.

Johnson was then elected alderman, and in 1830 became mayor of the town. On account of his direct speech and rough manner by 1834 he had gathered a following of farmers sufficient to elect him to the state Constitutional Convention. In 1835-37 and 1839-41 Johnson was a member of the state House of Representatives, and in 1841-43 he served in the state Senate. After 10 years in Tennessee politics, he was now ready, as the spokesman of a district of small farmers and tradesmen, to run for Federal office. Although disliked by regular Democrats, his effective attacks against the Whigs forced the Democrats to accept him in the party. In 1843 he was elected to the national House of Representatives from the first Tennessee district, and he held the seat for 10 years. He adopted the party view of slavery, but opposed the Democratic efforts in Congress to restrict squatter grants in the West. He left the House to become governor of Tennessee in 1853, and was reelected two years later, after a bitter campaign in which Johnson felt forced to carry a pistol for self-protection. He advocated state support of public schools, an opinion doubtless influenced by his childhood memories. In 1857 the former tailor was elected to the United States Senate, where he sponsored a bill, vetoed by Buchanan, giving 160 acres of the public domain to any settler developing the land. Upon the declaration of war, Johnson refused to join the Confederacy, and in 1862 was appointed military governor of Tennessee by Lincoln. He was nominated for the vice-presidency by the Union Republican Convention in 1864, and was elected. He became President in April, 1865, following the assassination of Lincoln.

Johnson was faced with the gigantic task of reconstruction along the lines planned by Lincoln. His blunt manner complicated a situation in which both sides were hypersensitive. In 1865 he issued an Amnesty Proclamation, providing for the establishment

of state civil governments, but soon encountered opposition in Congress, where Republicans wanted to exclude former Confederate leaders, while the South wished to send its most vigorous leaders to Washington. His differences with Congress reached an alarming stage in 1866 when he charged Stevens, Sumner, and Wendell Phillips with seeking to destroy the government. In 1867 Congress ignored Johnson's plan of political reconstruction, granted franchise to the negroes, and refused the ballot to many ex-Confederates. Unable to command strength in either house, the President submitted. Congress determined to increase its powers by restricting his, and in March 1867, passed the Tenure of Office Act (over Johnson's veto), which forbade the President's dismissal of any officer (whose appointment had received confirmation by the Senate) without Senatorial consent. As was intended, the President soon ran afoul of the law. He dismissed Edwin M. Stanton, Secretary of War, who had worked against him. In February, 1868, the House moved to impeach him for dismissing Stanton, adding charges which were manifestly irrelevant. Feeling against him ran high in both houses, but the affirmative vote of 35 to 19 lacked the necessary two-thirds majority.

At the expiration of his term of office Johnson returned to Greenville, and attempted repeatedly to win reelection to the Senate. In 1875 he succeeded. In Congress he made one ringing speech, attacking his enemies of a decade past, but paralysis forced him to return home, and he died at Carter's Station, Tenn., July 31, 1875. He was buried at Greenville. By his marriage three sons and two daughters were born.

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JOHNSON, BYRON BAN(CROFT) (1864-1931), baseball league manager, was born at Norwalk, Ohio, Jan. 6, 1864. He attended Oberlin and Marietta colleges, and then was a baseball writer for a Cincinnati newspaper. Johnson organized the Western League, of which he became president in 1893, and by 1899 his organization was competing in the major field with the National League. A baseball "war" ensued from which Johnson's organization emerged in 1903 as the American League. The creation of this second league was of great benefit to the national game since Johnson's organization made possible the annual World Series. Major league baseball prospered until the 1919 "Black Sox" scandal necessitated a housecleaning. Johnson opposed the appointment of Federal Judge K. M. Landis as baseball commissioner in 1920, and thenceforth the power of the American League president declined. Nevertheless, Johnson was reappointed to his post in 1925 for a term of 5 years. He collapsed in 1927, and resigned office. He died at St. Louis, Mar. 28, 1931.

JOHNSON, EASTMAN (1824-1906), American genre and portrait painter, was born at Lovell, Me., July 29, 1824. His portraits of Webster, John Quincy Adams, Longfellow, Emerson and Hawthorne antedate his art studies in Europe, where he was so highly thought of that he was offered the post of court painter at The Hague. Johnston's portrait work is dignified and well characterized, but less broadly handled than his genre works of American Negroes, which are remarkable for their naturalness. He died at New York, Apr. 5, 1906.

JOHNSON, EMORY RICHARD (1864-), American educator and economist, was born at Waupun, Wis., Mar. 22, 1864. After teaching economics at Haverford College in 1893-96 he became professor of transportation and commerce at the University of Pennsylvania where in 1919 he was appointed dean of the Wharton School of Finance and Commerce. He has served as transportation expert on the U.S. Shipping Board, the Bureau of Transportation, and on other Federal commissions.

JOHNSON, HIRAM WARREN (1866-), American political leader, was born in Sacramento, Cal., Sept. 2, 1866. He attended public schools and the University of California at Berkeley. He studied law, was admitted to the bar in 1888, and commenced practice in Sacramento. He moved to San Francisco in 1902. Johnson, from 1906 to 1909 distinguished himself for his fearless and able association with the prosecution of grafting politicians. He was thereupon selected as the gubernatorial candidate of the reform element who wanted to break the control of the state government by the Republican political ring and the Southern Pacific Railway. Johnson was elected in 1910 after an exciting campaign, and he proceeded to reform thoroughly the state governments so as to minimize the control of large corporations and parasitic political bodies. Direct primaries were introduced, the powers of the state railway commission were increased and a public utilities commission established. Johnson's driving energy successfully carried many amendments to the state constitution which would permit progressive legislation, including the initiative, referendum and recall, woman suffrage, employer's liability and workman's compensation acts. He was one of the founders of the Progressive Party in 1912, when, as the vice-presidential nominee on the ticket with THEODORE ROOSEVELT, he was chiefly responsible for carrying California for his party, by 11 electoral votes to two for WOODROW WILSON. He was reelected governor as a Progressive in 1914, serving as governor from Jan. 2, 1911 to Mar. 15, 1917. He signed the Webb Act of 1913 whereby Japanese were prohibited by state statute from holding land in California. With the disintegration of the Progressive Party in 1916, Johnson was unsympathetic to the Republican presidential candidacy of CHARLES EVANS HUGHES as was evidenced by the latter's loss of the state to Wilson, whereas Johnson was elected to the U.S. Senate by 300,000 plurality. He entered the Senate in March, 1917 and became a consistent opponent of President Wilson's policies, particularly did he oppose United States membership in the League of Nations. At the Republican National Convention,

1920, he was a prominent candidate for the presidential nomination. He was reelected to the Senate in 1922 and 1928, his term expiring in 1935.

JOHNSON, JAMES WELDON (1871-), American Negro author, was born in Jacksonville, Fla., June 17, 1871. He was educated at Atlanta University, Columbia University, Talladega College, Ala., and Howard University. He was principal of the Negro high school, Jacksonville, Fla.; practiced law there; served as United States Consul in Venezuela and Nicaragua; and later settled in New York City. He was secretary of the National Association for Advancement of Colored People. Johnson's publications include poems, spirituals, fiction and grand opera, among them *The Autobiography of an Ex-Colored Man,* 1912, and *God's Trombones,* 1927.

JOHNSON, MORDECAI WYATT (1890-), American educator, was born at Paris, Tenn., Jan. 12, 1890. He graduated from Morehouse College, Ga., (colored) in 1911; University of Chicago in 1913 and Rochester Theological Seminary in 1921; and studied theology at Harvard. From 1911-13 he was professor of English, economics and history at Morehouse College. He was ordained to the Baptist ministry in 1916, and preached at Charleston, W.Va., until 1926, when he became president of Howard University.

JOHNSON, REVERDY (1796-1876), American jurist, was born at Annapolis, Md., May 21, 1796. He established a law practice at Baltimore, Md., and appeared frequently in cases before the United States Supreme Court. During 1845-49 he was a member of the United States Senate and in 1849-50 served as Attorney-General under President Taylor. After a second term in the Senate in 1863-67 he was appointed ambassador to Great Britain in 1868. He died at Annapolis, Feb. 10, 1876.

JOHNSON, RICHARD MENTOR (1781-1850), 9th Vice-President of the United States, born at Bryant's Station, Ky., on Oct. 17, 1781. He was educated at Transylvania University, took up law, and began to practice at Grand Crossing on admission to the bar in 1800. In 1805 he was elected to the state legislature and in 1806 to Congress, serving until 1813. During the War of 1812 he recruited two Kentucky regiments, and participated in the Canadian campaign and at the battle of the Thames, rising to the rank of colonel. In 1814-18 he sat in the House and in 1819-29 in the Senate. During his service in the Senate and in the House, to which he was reelected in 1829-37, he supported ANDREW JACKSON. When the election of 1836 resulted in no choice of a Vice-President by the Electoral College, the Senate elected Johnson. Party opposition prevented his renomination for Vice-President in 1840, although the Democratic electoral votes went chiefly to him in the election, and he was beaten by the Whig, JOHN TYLER. In 1844 he unsuccessfully stood for nomination for President by the Democratic party. He died at Frankfort, Ky., on Nov. 19, 1850.

JOHNSON, ROBERT UNDERWOOD (1853-), American editor and author, was born in Washington, D.C., Jan. 12, 1853. He was graduated from Earlham College in 1871, and joined the staff of *The Century Magazine,* finally to become editor in 1909. He received recognition for his services in the cause of international copyright and toward conservation of forests. With C. C. Buell he edited *Battles and Leaders of the Civil War.* Johnson was Ambassador to Italy in 1920-21. His publications include several volumes of poems, among them *The Winter Hour* and *Saint Gaudens, An Ode.*

JOHNSON, ROSSITER (1840-1931), American editor and author, was born in Rochester, N.Y., Jan. 27, 1840, and educated at the University of Rochester. He was a newspaper editor from 1864-72, associate editor of the *American Cyclopedia* in 1873-77, and managing editor of the *Cyclopedia of American Biography* from 1886-89. In addition he compiled and edited *The British Poets, The Little Classics* series and *The World's Great Books.* He wrote many historical works, including *The Story of the Constitution* and *Captain John Smith.* Johnson died at Amagansett, N.Y., Oct. 3, 1931.

JOHNSON, SAMUEL (1709-84), English man of letters, was born in Lichfield, Sept. 18, 1709, the son of a bookseller. In his earliest childhood he gave evidence of prodigious intelligence, and supplemented his commonplace schooling by reading widely in his father's books. The older Johnson was never very prosperous, and his fortunes declined during the boy's youth into almost squalid poverty. The boy had some slight scrofulous taint, from which he suffered all his life, and whether his eccentricities were the result of his sickness or whether they arose as a defense against the world, none of his biographers has ever quite decided. At any rate, he was a soiled, burly, gruff young man when one of his father's customers, remarking his precocity, undertook to send him to Pembroke College, Oxford; and he remained a great, tattered, unkempt bear of a man all his days. He was too proud to tolerate the condescension and mockery of his companions at college, and left Oxford after two years, returning to his solitary self-instruction. At the age of 24 he married Mrs. Elizabeth Porter, a widow old enough to be his mother, whom he adored to the day of her death. He settled in Edial and took private pupils; but even as a young man he was frighteningly eccentric, and seldom successful in impressing the parents of prospective pupils. DAVID GARRICK was one of the few whom he managed to keep for some years, and with Garrick, in 1737, he went to London, bent on a literary career. He contributed occasional pieces and critical reviews to the flourishing *Gentleman's Magazine,* making a meager living. His first book, *London,* was published in 1738; and for this poem in celebration of the metropolis he received £10. In 1744 his life of Richard Savage appeared, and two years later he announced the plans for his *Dictionary of the English Language,* after being disappointed in his hope of persuading Lord Chesterfield to sponsor it. In 1749 he published his most successful poem, *The Vanity of Human*

Wishes, and in the same year Garrick produced his play, *Irene.* He established the *Rambler,* on the model of the famous SPECTATOR, and presently the volumes of his *Dictionary* began to appear. The *Dictionary* had some success from the start, and Lord Chesterfield, with almost incredible insensitiveness, wrote twice in praise of the work he had neglected at a time when his help would have meant the world to the struggling scholar. Johnson thereupon wrote him a letter so savagely sardonic, so magnificently proud, that, short as it is, it is often held to be his masterpiece.

Until the close of his life Johnson hardly knew the meaning of peace or financial security. RASSELAS, his most widely popular book, was written at top speed in a week, to pay for the funeral expenses of his mother. But in spite of his barbarous manners and ungainly body, Johnson's wit and his affectionate heart did increasingly give him the faculty of rousing a warm partisanship, sometimes amounting to a fanatical adoration, in some of the most remarkable men and women of his day. The strange fascination which he exercised on young JAMES BOSWELL resulted in the greatest biography ever written. At last, in 1762, England awoke to her duty toward her strange, gross genius, and Johnson was given a Civil List pension of £300 a year, on which, if he had not gathered under one roof almost every stray beggar of his acquaintance, he might have lived with fair comfort. In 1765 he issued his long-awaited *Life of Shakespeare,* and in 1779 the first of his series on the *Lives of the English Poets* began to appear. Johnson died in London, Dec. 13, 1784, mourned by a nation which had sometimes ignored him, sometimes shown sheer terror of him; he was buried in Westminster Abbey. To the last he felt that his life had been indolent, wasteful and ill-spent. *See also* DICTIONARY; ENGLISH LITERATURE. D. B.

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JOHNSON, THOMAS LOFTIN (1854-1911), American political reformer, was born at Georgetown, Ky., on July 18, 1854. By inventing a fare box and the Johnson rail for street cars he made a small fortune, which he increased through holdings in street railways in Indianapolis, Cleveland and Detroit. In 1890-94 he represented his Ohio district in Congress where he advocated the single tax of Henry George and public ownership of utilities. While mayor of Cleveland in 1901-09, he became the subject of nation-wide attention on account of his radical reforms in municipal government; e.g., the introduction of the three cent fare on all lines throughout the city. In 1903 he was an unsuccessful candidate for governor of Ohio. He retired from public life in 1910, and died in Cleveland on Apr. 10, 1911.

JOHNSON, SIR WILLIAM (1715-74), British soldier, was born in Smithtown, County Meath, Ireland, in 1715. He came to America in 1738 to manage his uncle's estates in the Mohawk Valley, in New York Colony. He made friends with the Indians, standing so well with them that, in 1744, Governor Clinton gave him charge of the affairs of the Six Nations. To this friendship, also, is due the fact that the Six Nations refused to join the French in the French and Indian War. In this war Johnson led contingents to the relief of Oswego and Fort William Henry, and participated in the battles at Ticonderoga and Fort Niagara, the latter of which he compelled to surrender. For his services in the French and Indian War, he received a grant of 100,000 acres of land on which he built Johnson Hall and laid the foundations of Johnstown, N.Y., where he died, July 11, 1774.

JOHNSON CITY, a manufacturing city in Broome Co., southern New York, situated on the Susquehanna River, 3 mi. west of Binghamton. It is served by two railroads. Johnson City is the home of the Endicott Johnson Shoe Corporation, which affords the city its chief industrial activity. There are also various other manufactures. In 1929 the manufactures amounted approximately to $15,000,000; the retail trade reached a total of $4,813,362. Johnson City was incorporated in 1891. Pop. 1920, 8,587; 1930, 13,567.

JOHNSON CITY, a city in Washington Co., eastern Tennessee, 90 mi. northeast of Knoxville. It is served by the Southern, the East Tennessee and Western North Carolina and the Clinchfield railways and motor buses. Industries include tobacco, grain and garden-truck raising, dairying and the manufacture of flooring, furniture, brick and other products. In 1929 the manufactures reached approximately $10,000,000; the retail trade amounted to $13,883,644. A national soldiers' home, a state teachers' college and Milligan College are located here. Johnson City is associated historically with such names as DANIEL BOONE, ANDREW JACKSON and DAVID CROCKETT. Pop. 1920, 12,442; 1930, 25,080; 9% colored.

JOHNSON COUNTY WAR, Wyoming, 1892, an armed conflict between agents of the Wyoming Stock Growers' Association and the farmers and small cattlemen of Johnson County; the culmination of ill-feeling on the part of the small cattlemen at the dictatorial methods of the owners of large ranches, and on the part of the association members at thefts of cattle and the refusal of juries to convict. Twenty-five roustabouts were hired in Denver, conveyed through Cheyenne on a special train, and on Apr. 6 taken to Casper, the railway point nearest Johnson County. The band, accompanied by several members of the association, killed two suspected rustlers, and on Apr. 10 engaged near Buffalo, Wyo., in a pitched battle with some 200 settlers. The raiders were besieged, but rescued by the intervention of Federal cavalry three days later.

JOHNSON C. SMITH UNIVERSITY, at Charlotte, N.C., an institution for Negroes, founded in 1868 under the name of Biddle University. It is privately endowed and controlled, and is non-secta-

rian. The university comprises preparatory, arts and science, special and theological courses. It had productive funds in 1931 amounting to $1,861,892. The library contained 16,813 volumes. In 1931-32 there were 363 students and a faculty of 25, headed by Pres. H. L. McCrorey.

JOHNSON GRASS (*Holcus halepensis*), a valuable forage plant native to the Mediterranean region, now widely distributed in the warmer parts of America. It is a vigorous perennial rising 3 to 5 ft. high from stout creeping rootstocks. In appearance it resembles small forms of sorghum, to which it is closely allied. It is an excellent and widely used forage grass in the southern states, but in certain soils, as in the black lands of Alabama and Texas, it has become an extremely pernicious weed. Like the sorghums, Johnson grass, especially in second growth, occasionally produces hydrocyanic acid in sufficient quantity to poison grazing animals.



FROM JEPSON. MAN. FL. PLANTS CALIF., COPYRIGHT

JOHNSON GRASS
Pair of spikelets and rhizome and flowering panicle

JOHNSTON, ALBERT SIDNEY (1803-62), American Confederate general, was born at Washington, Ky., on Feb. 3, 1803. He graduated in 1826 from West Point. Having removed to Texas in 1834, he took a prominent part in the Texas struggle for independence as commander of a division, and was an important figure in the Mexican war. In 1857, when a colonel, he showed great finesse in conducting the campaign against the Mormons. He was then placed in command of the Department of the Pacific. In April 1861, he resigned his post, and entered the Confederate army as a general in command of the Confederate army in the West. He was considered by both sides a leader of superior ability. On Apr. 6, 1862, at Shiloh he attacked Grant's army, forcing it back to Pittsburgh Landing and capturing 3,000 Union men. During the battle he was killed at the head of a charging body of his troops.

JOHNSTON, JOSEPH EGGLESTON (1807-1891), American Confederate general, was born near Farmville, Va., on Feb. 3, 1807, and graduated in 1829 at West Point. He fought in the Black Hawk and Seminole wars, and proved a capable officer in the Mexican War. In 1861 he entered the Confederate army as major-general, and while in command of the army of the Shenandoah, won the first important Confederate victory at BULL RUN. He then became a full general and although not a spectacular leader, was considered one of the most formidable by the opposition. In 1863 he commanded the forces of the Mississippi and was unsuccessful in checking Grant's advance on Vicksburg. In 1865 he failed, because of inadequate forces, to stop Sherman's march through the Carolinas. After Lee's surrender he negotiated terms of peace with Sherman. He represented the Richmond district in Congress in 1877, and in 1887 became commissioner of railroads under President Cleveland. He died at Washington on Mar. 21, 1891.

JOHNSTON, MARY (1870-), American novelist, was born in Buchanan, Botetourt Co., Va., Nov. 21, 1870. Her novels are concerned chiefly with American history as it was exemplified in Virginia. They include *Prisoners of Hope, To Have and To Hold,* 1900, *Audrey, Lewis Rand, The Long Roll, Cease Firing,* 1912, *Hagar, The Witch, Michael Forth, Croatan, The Slave Ship* and *The Exile,* 1927.

JOHNSTON, a town of northern Rhode Island, in Providence Co., situated on the New York, New Haven & Hartford railroad adjoining Providence. It manufactures soap and textiles. Pop. 1920, 6,855; 1930, 9,357.

JOHNSTON CITY, a city in Williamson Co., southern Illinois, located 90 mi. southeast of St. Louis, Mo. It is served by three railroads. Coal mining is the chief industry of the city and its environs. Grain and fruit are the principal crops grown in the vicinity. Johnston City was incorporated as a city in 1905. Pop. 1920, 7,137; 1930, 5,955.

JOHNSTOWN, a manufacturing city in eastern New York, the county seat of Fulton Co., situated on Cayadutta Creek, near the Mohawk River, 48 mi. northwest of Albany. The Fonda, Johnstown and Gloversville Railroad serves the city and connects with the New York Central Railroad at Fonda, a short distance south. Johnstown, Gloversville and the adjacent rural district, where work is done in the homes, produce the major part of the gloves made in the United States. Such industries as tanning and other trades pertaining to glove-manufacture are carried on. The industrial output of the city, 1929, was valued at $15,077,308. The retail business in 1929 amounted to $5,555,661. Scotch settlers made their home in Johnstown in 1760. Features of interest are the old court house and the homes of Sir William Johnson and Col. John Butler. The city was the scene of some Revolutionary fighting. Pop. 1920, 10,908; 1930, 10,801.

JOHNSTOWN, a city of southwestern Pennsylvania, in Cambria Co., about 70 mi. southeast of Pittsburgh, on the Conemaugh and Stonycreek rivers; it is served by the Baltimore and Ohio and the Pennsylvania railways, eight bus lines and airport. Located in the scenic Allegheny Mountains at an altitude of 1,100 ft., Johnstown is an important coal-mining and steel-producing center; the region is rich in iron, clay, sandstone and coal. Electrical and mine equipment, brick and other commodities are manufactured, aggregating $103,000,000 in value annually. In 1929 the industrial output reached approximately $124,000,000; the retail trade amounted to $43,011,571.

Johnstown, settled by and named for Joseph Johns

in 1800, was incorporated in 1889, and in that year occurred the unprecedented flood, from which the town rapidly recovered through a nationwide relief fund. Pop. 1920, 67,327; 1930, 66,993; 18% foreign-born; 2½% colored.

JOHN THE BAPTIST (c. 5 B.C.-30 A.D.), was, according to the Gospels in the New Testament, the forerunner of Jesus and the last of the Hebrew prophets. He was the son of Zacharias, a Jewish priest, and of Elizabeth, who was a cousin of Mary, the mother of Jesus. Around his birth stories of a miraculous nature gathered, according to which an aged, barren woman became his mother after the father had received an announcement of the coming event from an angel. He early began his preaching in the valley of the Jordan in the wilderness of Judea,



JOHN THE BAPTIST
After an engraving by Martin Schongauer

which fact the Gospel writers associated with the words of the Prophet Isaiah, "The voice of one crying in the wilderness, make ye ready a way for the Lord." He is said to have worn "raiment of camel's hair, and a leathern girdle about his loins, and his food was locusts and wild honey." He announced the forthcoming mission of his cousin, Jesus, "one mightier than I," who nevertheless received baptism in the Jordan from John. John was imprisoned by Herod for rebuking that tetrarch because of his marriage to his stepbrother's wife, and to please the whim of Salome, the daughter of Herodias, Herod had him beheaded.

JOHORE, one of the Malay States under British suzerainty. It lies at the southern end of the Peninsula and has an area of 7,678 sq. mi. Johore Baharu, with a population of 15,000, is the capital. Rubber, pineapples, copra and tapioca are the chief products. In 1929 Johore had a population of 336,829, two-thirds of which were Malays, and the rest Chinese and Indians. The natives are Mohammedans. Pop. 1930, 343,063. *See also* MALAY STATES, FEDERATED.

JOINERY, the forming and installing in buildings of those portions of the wood work such as trim, windows, doors, and the like, which are not essential to the strength or stability of the structure.

The work formerly included the making of trim, moulding, etc., but the introduction of WOOD WORKING MACHINERY has made it no longer necessary for the "joiner" to be skilled in this line. As a matter of fact, the work now consists largely in the erection of the finished material as supplied by the wood working mills.

JOINT, in geology, a natural, more or less perpendicular crack or fissure in surface rock which has been fractured, but not displaced, by movements of the earth's crust. Joints, often tightly closed, may be seen seaming the face of a cliff at right angles to the strata. Master-joints may go down thousands of feet through an entire formation; minor ones frequently end where a stratum of differing character is met. Intersecting systems of joints sometimes divide SEDIMENTARY ROCKS into somewhat regular blocks, large or small. Joints in volcanic rocks, which are caused by shrinkage in cooling, produce the picturesque prismatic, columnar structure observed in Fingal's Cave. The natural jointing of rock greatly facilitates the cutting of canals, also tunneling, quarrying, and mining enterprises; it is also of many-sided geologic importance, favoring the circulation of ground-water, the destructive work of frost and wind and stream erosion, with the resultant formation of soils, and the attritional action of waves upon sea-cliffs. Moreover, along the line of these joints occur those slippings of the strata called *faulting,* the most important cause of earthquakes. *See also* FAULT.

JOINT ARMY AND NAVY BOARD, U.S. *See* ARMY AND NAVY JOINT BOARD.

JOINT FIR, the general name for a genus (*Ephedra*) of peculiar shrubs of the GNETUM family in appearance resembling the horsetails. They are usually low, much-branched shrubs, apparently destitute of foliage. The slender, long-jointed stems bear opposite or clustered green branches; minute, scalelike leaves; small flowers in catkins, and a bracted, cone-shaped, sometimes fleshy fruit enclosing a nutlike seed. There are about 25 species found chiefly in alkaline soils in warm arid regions. Seven species, commonly called Mexican tea and joint pine, occur in the deserts of the Southwestern States. The valuable drug EPHEDRIN is obtained from an Old World species, *Ephedra sinica. See also* HORSETAIL.

JOINTS, mechanical unions or connections between two pieces of material, two edges of the same piece, or between two pipes, shafts or other devices. There are welded joints, soldered or brazed joints, and plain joints. Any form of coupling is also a joint. There are rigid joints and flexible joints, both parts moving at the same time either rigidly or flexibly. There are also universal joints or COUPLINGS which permit one shaft to drive another, even though

the alignment is not perfect. Every automobile uses universal joints between the engine and the differential gears. There are many designs of universal joints. Some use a strong fabric to secure the desired flexibility, but nearly all types of universal joints drive through metal parts.

JOINTS AND LIGAMENTS. The individual bones of the human skeleton fit together by articulations or joints. Anatomists classify joints into three groups, according as the interval between the bones is occupied by fibrous connective tissue, by cartilage, or by a joint cavity. Obviously, freedom of movement is much greater in the third class, it is slight in the second and practically non-existent in the first.

Among joints where fibrous tissue is interposed are the sutures of the SKULL. They permit growth rather than movement. The bones grow across them and fuse between the thirtieth and fortieth year of life. Up to that time they serve to diminish the transmission of force from blows on the head. The insertion of teeth in their sockets is another joint of this kind, as are also the fibrous membranes connecting the bones of the forearm and leg.

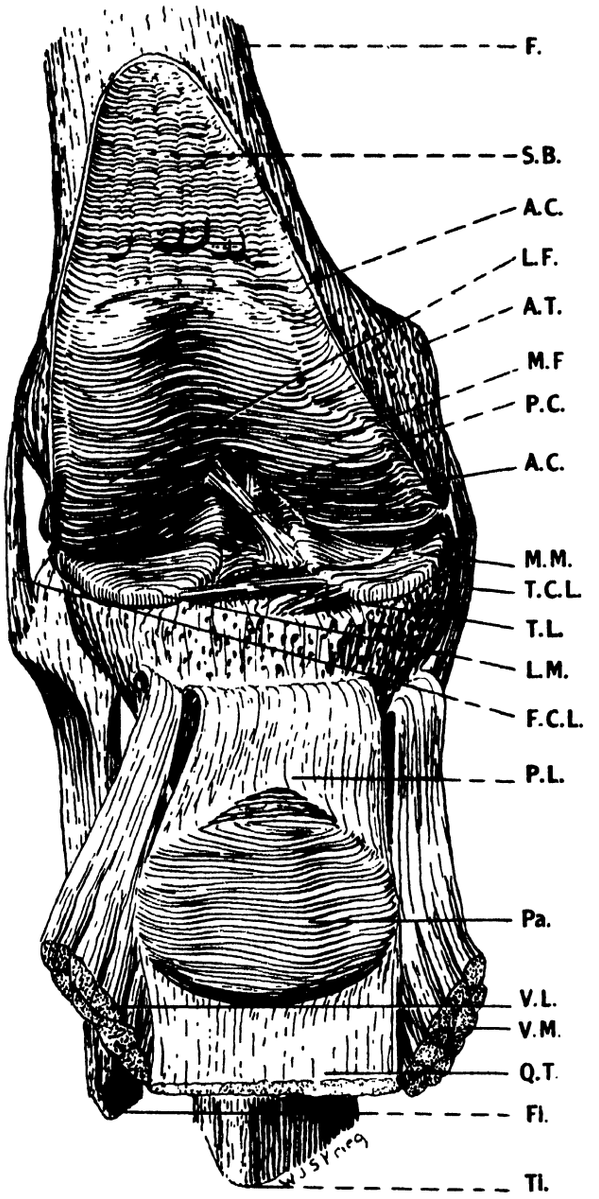
Examples of interposed cartilage may be seen between the first rib and the sternum, and between the occipital and sphenoid bones in the skull. Other examples are the disks between the bodies of the vertebrae and the symphysis pubis, connecting the right and left halves of the pelvis in the ventral midline.

Most of the joints of the human body, including all the freely moving joints, possess a joint cavity. Periosteum covers the bones, except on the joint surfaces. These are covered by hyaline cartilage. A capsular ligament surrounds the joint cavity. It is attached to the periosteum on the bone surface, at some distance from the joint cartilage—greater as the range and freedom of movement are greater. The walls of the cavity are formed on the ends of the bones by hyaline cartilage, elsewhere by the smooth and slippery synovial membrane which thus lines the capsular ligament and is reflected from its attachments over the surface of the periosteum to the margin of the cartilage. This membrane secretes a lubricating fluid, the synovia.

The ligaments are made of strong white fibrous connective tissue, whose function is to stabilize the joints. Also they limit movement. Thus, the capsular ligament behind the knee is short and limits movement of the leg forward.

The synovial membrane has a good blood supply and so secretes enough lubricating fluid. In inflammations it secretes it in excess and the abundant fluid keeps the bones apart, securing rest for them. This membrane also has many nerves which convey to the brain sensory impulses, giving awareness of position, thus helping to produce marvelously delicate control of movements.

The hyaline cartilage has neither nerves or blood vessels. It is, however, very elastic, so it is well adapted for its rôle of "thrust block." The series of joint cartilages in the leg, for example, are good shock absorbers. They get their nourishment by the seeping of fluids through them from their outer margins, and the intermittent pressure to which they are subjected helps this seepage. They grow rapidly, which is necessary because they are ground off—for example,



HUMAN RIGHT KNEE JOINT VIEWED FROM THE FRONT

A.C., *articular capsule;* A.C., *anterior crusiate ligament;* A.T., *adductor tubercle;* F., *femur;* F.C.L., *fibular collateral ligament;* Fi., *fibula;* L.F., *lateral condyle of femur;* L.M., *lateral meniscus;* M.F., *medial condyle of femur;* M.M., *medial meniscus;* Pa., *articular surface of patella;* P.C., *posterior cruciate ligament;* P.L., *patellar ligament (turned downward);* Q.T., *tendon of quadriceps femoris muscle;* S.B., *suprapatellar bursa;* T.C.L., *tibial collateral ligament;* Ti., *tibia;* T.L., *transverse ligament;* V.L., *vastus lateralis muscle and tendon;* V.M., *vastus medialis muscle and tendon*

the head of the femur grinds its socket on the hip bone like a pestle in a mortar with all the weight of the body. The cartilage debris ground off adds itself to the lubricating fluid, thus helping to produce its own lubrication. The absence of sensation in cartilage is a most important qualification for this thrust block service.

The kind of motion possible at a movable joint is

determined by the shape of the articulating surfaces: thus flat surfaces permit gliding movement; reciprocal saddle-shaped surfaces, as in the joint at the proximal end of the metacarpal bone of the thumb, permit free movement in almost any direction; hinge-shaped joints, like the elbow, permit movement in one direction only; ball and socket arrangements, such as exist in the shoulder joint and hip, permit the greatest range of motion that exists in connection with any of the joints of the body.

In some joints several bones take part, as at the WRIST and at the articulation between the skull and vertebral column. In these there may be several separate joint cavities and the arrangement of ligaments may be quite complex. B. C. H. H.

JOINVILLE, JEAN, SIRE DE (1224-1319), seneschal of Champagne, is chiefly distinguished for his *Mémoires* or *Le Livre des Saintes Paroles et des Bonnes Actions de St. Louis.* He accompanied Louis IX on his crusade to Egypt in 1249, returning in 1254, but refused to go on the crusade to Tunis. He was on intimate terms with the king and a frequent attendant at court. He was a witness during the process for the king's canonization. This historical work which is so justly famed, was undertaken in Joinville's old age at the instigation of Jeanne of Navarre, queen of Philip IV. While it is the record of an eye-witness, it is one which was set down many years after the event by a man who was not himself a prominent figure in those events. Joinville devotes himself especially to discussing the character of Louis. Consequently we have more detailed information about the king as a personality than about most medieval figures. Incidentally the author gives a description of the aristocratic point of view prevailing in the 13th century. In the history of French literature the *Memoires* stand among the earliest examples of historical prose in the vernacular, interesting also because written by a layman. The work is marked by a naïve vivacity which gives it a peculiar charm.

JOKAI, MAURUS (1825-1904), Hungarian novelist, journalist and publicist, was born at Komorn, Feb. 19, 1825. He took an active part in the Revolution of 1848, served for 30 years as a member of the Lower House of the Hungarian Parliament, received a great ovation from the entire nation in 1896, and was made a member for life of the Hungarian House of Lords in 1897. During his career he married Roza Benke Laborfalvi, the great Hungarian tragedienne. Jokai was exceptionally prolific, and wrote some 300 novels covering all phases of Hungarian life. His earlier masterpieces are *Hungarian Nabob,* 1856, *The New Squire,* 1862, and *The Poor Rich,* 1881. Later important novels are *A Man of Gold* and *Eyes Like the Sea.* In the sphere of journalism, Jokai edited a great political daily, and also a humorous weekly entitled *The Ustokos.* He died at Budapest, May 5, 1904.

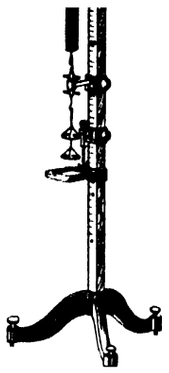
JOLIET, LOUIS (1645-1700), American explorer, was born at Quebec, Sept. 21, 1645. Though educated for the priesthood, he was caught by the adventurous sweep of the times and became a trader among the Indian tribes of Canada. In 1669 he began a search for the fabulous copper mines on the shores of Lake Superior, which continued until, in 1672, he was sent by FRONTENAC, the French governor of Canada, to explore the river that was said to lie west of the Great Lakes and to flow into the Southern Sea. He spent the winter of 1672-73 at Mackinaw with MARQUETTE, setting out the following spring on his quest. On June 17 he discovered the Mississippi, upon which he drifted until he became certain that it emptied into the Gulf of Mexico. On his return journey, his canoe upset in the Lachine rapids, and he lost all his documents. He, however, wrote an account of his journey from memory. Later, he explored parts of Labrador and was granted the seigniory of Joliet, south of Quebec. He died in Canada in May, 1700.

JOLIET, a city of northeastern Illinois, the county seat of Will Co., and a shipping center on the Desplaines River and the Illinois and Michigan Canal, 37 mi. southwest of Chicago. It is served by several railroads and intersected by Federal and state highways. There is a municipal airport. Joliet is advantageously located on the line of the Lakes-to-the-Gulf Waterway from Chicago to the Gulf of Mexico, under construction by the Federal Government. By means of this canal, lake steamers will be enabled to come from the Atlantic through the Great Lakes and the Chicago Sanitary Ship Canal to Joliet, discharge their cargoes and reload at docks without re-handling of freight, thus making the city a port of entry for ocean and lake steamers. The suburban territory has important limestone quarries, gas-works, and coal mines. Abundant waterpower promotes the city's industries including manufactories of iron and steel, stoves, and wall-paper. In 1929 the manufactures reached approximately $39,000,000; the retail trade amounted to $35,694,372. A state prison is situated at Joliet. The city, founded about 1833 and chartered in 1852, was originally called Juliet, after the daughter of an early settler; it was renamed in 1845 to honor the explorer Joliet. Pop. 1920, 38,442; 1930, 42,993.

JOLIETTE, the county town of Joliette Co., Quebec, Canada, situated on the Canadian National Railway, and l'Assomption River, 36 mi. north of Montreal. Joliette is the trading and shipping point of an agricultural and timbering country, and, in addition, has industrial interests in grist, steel, lumber, woolen, and paper mills, limestone quarries, tobacco factories and foundries. Power is supplied by the SHAWINIGAN FALLS development. There are several educational institutions, and a Roman Catholic cathedral. Joliette was founded in 1823 and incorporated in 1863. Pop. 1921, 9,039; 1931, 10,758.

JOLLY BALANCE, an apparatus for determining SPECIFIC GRAVITY. It comprises a vertical standard with a helical spring suspended from its upper end, a scale and a weighing pan. The weight of a substance is determined both in air and water by noting the

elongation of the spring with the substance on the pan and then producing an equal elongation with a known weight. The specific gravity is determined by dividing the weight in air by the difference between the weight in air and the weight in water.



JOLLY BALANCE

JONAH, BOOK OF, derives its name from a Hebrew prophet who is said to have lived in or before the reign of Jeroboam II. The date of the book, probably post-exilic, and its authorship are unknown. In its pages we are told the prophet is commissioned by God to preach against Nineveh; but he evades the task, and while at sea is made the victim of superstitious sailors who seek to calm a storm by casting him overboard. The story of the fish prepared to swallow him has parallels in the legends of Egypt, Greece and Babylonia. The main theme of the book is that God desires the salvation of the Gentiles.

JONATHAN, a Hebrew commander, eldest son of King Saul and Achinoam, and bosom friend of David. He shares the army life of his father, won a notable victory at Michmash, and was killed with his father and two brothers at the battle of Gilboa. In Hebrew tradition his fame rests chiefly on his unselfish friendship for David, whom he often saved from Saul's jealous wrath, and for whom he renounced his own right to succeed to the throne. While some scholars say that the meeting in the wilderness of Ziph is "obviously an innocent piece of romance," the love of Jonathan and David has become one of the world's most highly esteemed ideals of friendship.

JONES, ALFRED GILPIN (1824-1906), Canadian statesman, was born at Weymouth, N.S., in Sept. 1824. He came into prominence politically as a leader of the Nova Scotia opposition to Confederation. He was a member of the Dominion parliament 1867-72, 1874-78, 1887-91, and in 1874-78 served as minister of militia in Alexander Mackenzie's cabinet. He was appointed lieutenant governor of Nova Scotia in 1900 and continued in that office until his death, Mar. 15, 1906.

JONES, CECIL CHARLES (1872-), Canadian educator, was born at Moncton, N.B., Feb. 11, 1872. He studied at the universities of New Brunswick, Harvard and Chicago. From 1898-1906 Jones was professor of mathematics at Acadia College, Wolfville, N.S. In 1906 he was chosen chancellor and professor of mathematics at the University of New Brunswick. He has been a frequent contributor to educational journals and from 1910-21 was a member of the Royal Conservation Commission.

JONES, HENRY ARTHUR (1851-1929), English playwright, was born in Buckinghamshire, Sept. 21, 1851. He left school at 13, and while in business wrote his first successful play, *Clerical Error,* produced by Wilson Barrett in 1879. *The Silver King* followed, and was played by Barrett for several years in England and America. Some other plays were *Saints and Sinners, Judah, The Tempter, The Rogues, Comedy, The Liars, Carnac Sahib, Mrs. Dane's Defence, The Hypocrites, Mary Goes First* and *The Lie.* Jones also wrote *The Renascence of the English Drama, The Foundation of a National Drama* and *The Theatre of Ideas,* 1915. He visited America in 1914. Jones died in England, Jan. 7, 1929.

JONES, INIGO (1573-1652), British architect, was born in London, July 15, 1573. His parents were in humble circumstances. Probably at the expense of the Earl of Pembroke, who became interested in his talents, he visited Italy, spending his time studying painting. After returning to England, he visited Denmark, and then spent eight years in London arranging masks and other court entertainments. After a second trip to Italy, where he probably studied architecture, he returned to be made King's Surveyor of Works. It is believed that he designed the Resenborg Palace, Copenhagen, and it seems certain that he was architect to Anne of Denmark, Queen of James I of England. Jones' most celebrated work was the plan for Whitehall Palace, only the banqueting hall of which was finished. He had a great influence, however, upon the growth of architecture in England. He introduced and emphasized classical forms and produced a definite academic form. He died at Somerset House, June 21, 1652.

JONES, JOHN PAUL (1747-92), American naval officer, was born John Paul in Kirkcudbright, Scotland, on July 6, 1747. At the age of 12 he was apprenticed to a shipmaster, and gained much sea experience on subsequent voyages. When his master failed, Jones served a short time in the royal navy. In 1775 he was commissioned by the Continental Congress senior lieutenant in the new Continental navy, and the following year took part in an expedition against the Bahamas. In May, 1776, commanding the *Providence,* he convoyed ships carrying supplies for the defense of New York. Later, with a captain's commission, he embarked on a free lance cruise, capturing many prizes. On Nov. 1, 1777, he sailed for France with dispatches announcing Burgoyne's surrender. He subsequently made further privateering cruises, raiding the British coast and shipping. Obtaining, through Franklin's influence, a French ship which he rechristened the *Bon Homme Richard,* he assembled a small fleet, and setting out on Aug. 14, 1779, encountered a British merchant fleet convoyed by the *Serapis* and the *Countess of Scarborough.* The ensuing combat on Sept. 23 between the *Bon Homme Richard* and the *Serapis* lasted three and one-half hours, and ended in the surrender of the *Serapis,* the *Bon Homme Richard* sinking next day. For this victory Jones received honors from Congress and from Louis XVI of France. Jones subsequently spent a short time in the Russian service, but resigned

because of the intrigues of his colleagues against him. He retired to Paris in 1790, where he died July 19, 1792. His body was brought to the United States in 1905 and interred at the U.S. Naval Academy, Annapolis, Md.

JONES, LEWIS RALPH (1864-), American botanist, was born at Brandon, Wis., Dec. 5, 1864. From 1883 to 1886 he was a student at Ripon College. In 1889 he received the baccalaureate degree from the University of Michigan and in 1904 the doctorate. In 1930 he was awarded the degree of doctor of science by Cambridge University (England). He was professor of botany in the University of Vermont from 1889 to 1910 when he became professor of plant pathology in the University of Wisconsin. His writings include *Flora of Vermont* (joint author) and numerous important contributions to scientific journals, especially in the field of plant pathology. He also served as editor of *Phytopathology* and the *American Journal of Botany.*

JONES, ROBERT TYRE, JR. (1902-), American golfer, was born at Atlanta, Ga., Mar. 17, 1902. He was educated in engineering at Georgia School of Technology, received a bachelor's degree at Harvard and studied law at Emory University, being admitted to the Georgia bar in 1928. He was United States national amateur golf champion in 1924, 1925, 1927, 1928 and 1930; national open champion in 1923, 1926, 1929 and 1930; open champion of Great Britain in 1926, 1927 and 1930; British amateur champion in 1930. He was the first golfer to hold the four major golfing titles, the amateur and open championships of both the United States and of Great Britain in one season (1930). Jones retired from competitive golf play in November, 1930. He became in 1931 a member of the board of directors of A. G. Spalding & Bros. Co. and maintained law offices in Atlanta, Ga.

JONES, THOMAS JESSE (1873-), American sociologist, was born in Llanfacthraeth, Wales, Aug. 4, 1873. He came to America in 1884, was graduated from Marietta College in 1897, and subsequently took degrees at Columbia and at Union Theological Seminary. After a year in social settlement work in New York, he directed the research department of Hampton Institute, Va., for seven years. He was statistician in the United States Census Bureau, 1909-12, and specialist in education with the United States Bureau of Education, 1912-19. In 1913 Jones became educational director of the Phelps Stokes Fund. His work on various important committees included the chairmanship of the Education Committee to West, South and Equatorial Africa, 1920-21, and to East Africa, 1924. Among his publications are *Educational Adaptations, Education in Africa* and *Essentials of Civilization.*

JONES, WESLEY LIVSEY (1863-1932), American legislator, was born in Bethany, Ill., on Oct. 9, 1863. As a student he was keenly interested in politics, and campaigned for Blaine in 1884 and for Harrison in 1888. After finishing law school at Southern Illinois College in 1886, he went to Washington territory, and began practicing in 1890 at Yakima. He was prominent in the public affairs of the state, and in 1899 was elected as a Republican to the House of Representatives. In 1909, 1914, 1920 and 1926 he was elected to the United States Senate. He sponsored the Jones-White shipping act which made construction loans possible, and was the author of the Jones Act, which imposed severe penalties for violation of the Volstead Act. He died at Seattle, Wash., Nov. 19, 1932.

JONESBORO, a city and the county seat of Craighead Co., in northeastern Arkansas, situated 65 mi. northwest of Memphis, Tenn. Two railroads and bus lines serve the city. Cotton, corn, rice and dairy products are raised in the district. The city is a manufacturing center producing lumber products and golf clubs. The retail trade in 1929 amounted to $6,741,751. Jonesboro is the seat of the State Agricultural and Mechanical College and of Jonesboro College. The city was founded in 1859. Pop. 1920, 9,384; 1930, 10,326.

JONESCU, TAKE (1858-1922), a Rumanian politician, writer, and orator, who was born at Ploesci on Oct. 26, 1858. He studied law in Paris and began his parliamentary career when elected a deputy in 1884. He served as Minister of Public Instruction or of Finance in several Conservative cabinets, and in 1908 founded the Conservative-Democratic Party. In 1912 he acted as Minister of the Interior in a coalition cabinet under M. Maiorescu, and in 1913 he represented his country at the peace conference of Bucharest which followed upon the Second Balkan War. Jonescu was unfriendly to Germany, and upon the outbreak of the World War favored Rumania's immediate entry upon the side of the Allies. In 1918 he went to Paris as head of the Rumanian National Committee which strove to uphold Rumanian rights and interests despite the circumstance that a separate peace had earlier been signed with the Central Powers. He held the post of Foreign Minister in the Averescu government in 1920 and served as premier for a time in 1921-22. Jonescu was very much in favor of the formation of a Danubian Federation, but when Rumania's neighbors failed to cooperate, he actively supported the negotiations which led to the creation of the Little Entente. He died in Rome on June 21, 1922.

JÖNKÖPING, a city in Sweden, capital of the district of the same name and one of the chief industrial centers of the country. It is situated 230 mi. southwest of Stockholm, at the southern end of Lake Vetter. The city is especially noted for its match industry, which was established here about 1842. There are also machine shops, paper works and textile mills. In 1612 the Swedes destroyed the city rather than see it taken by the Danes. Later it was rebuilt and became the seat of the first important Swedish textile industry. Pop. 1931, 39,018.

JONQUIL (*Narcissus Jonquilla*), a hardy early-blooming bulbous plant of the lily family, closely allied botanically to the narcissus and the daffodil. The jonquil is a native of southern Europe and Algeria, long cultivated in gardens as a spring ornamental. It is a very slender, graceful plant, about 15

in. high, with glossy, deep green, very narrow, rush-like leaves. The flower stalk, which rises to about the same height as the leaves, bears a small cluster of fragrant, usually horizontal or somewhat nodding, yellow flowers about an inch long.

JONSON, BEN (1573?-1637), English dramatist, was born probably at Westminster early in 1573, of middle-class stock and possibly of Scotch Border descent. He was educated at Westminster School, worked as a bricklayer for his step-father and then as a soldier in Flanders, married at 21, and within a few years was acting in Henslowe's company at London. Here a brawl with a fellow-actor caused his imprisonment for murder and his speedy release preparatory to the production of the famous comedy, *Every Man in his Humour,* 1598, in which Shakespeare was one of the actors. This realistic comedy of contemporary London life was followed by a number of plays embodying caricatures of his literary enemies, the best known of these being *Cynthia's Revels,* 1600, and *Poetaster,* 1601. Jonson's remaining dramatic masterpieces comprising four comedies and two historical tragedies were produced as follows: *Sejanus,* 1603, Roman tragedy remaining human despite its learned allusions; *Volpone,* 1605, a comedy of Venice in which hypocrisy meets retribution; *Epicœne, or the Silent Woman,* 1609, a study of mental eccentricity; *The Alchemist,* 1610, social satire on human gullibility; *Catiline,* 1611, a second popular Roman tragedy, and *Bartholomew Fair,* 1614, excellent farce. Jonson was also the author of masques for the court of King James, a highly poetical pastoral drama and a number of brilliant lyrics. In his later years he became the oracle at the Mermaid Tavern. He died Aug. 6, 1637, the acknowledged literary dictator in an age which was one of the most brilliant England has known. He was buried in Westminster Abbey.

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JOPLIN, a city in southwest Missouri, in Jasper and Newton counties, situated 159 mi. south of Kansas City. Bus and truck lines, airplanes and four railroads make the city a shipping market for fruit and live stock and also the lead and zinc products which are manufactured here. In 1929 the factory output reached an approximate total of $17,000,000; the retail trade amounted to $22,473,145. Joplin is in the Ozark Mountain region. There were a few settlers in the vicinity by 1838. The town was laid out and incorporated in 1871 and in 1872 it consolidated with a town on the opposite side of the creek and became Union City. Later it was called Joplin after an early settler and in 1888 received a charter of incorporation as a city. Pop. 1920, 29,902; 1930, 33,454.

JORDAENS, JACOB (1593-1678), Flemish painter, was born at Antwerp, May 19, 1593. He was greatly influenced by Rubens, with whom he worked and from whom he received a commission for a series of tapestry cartoons for Philip IV of Spain. Other royal commissions were executed for Charles I of England and Charles Gustavus of Sweden. Jordaens's most important works are the murals executed for the widow of Frederick Henry of Orange in her palace, near The Hague. His painting is characteristic of the Flemish School; his best canvases have an effective glow and his rare portraits great vitality. Jordaens died at Antwerp, Oct. 18, 1678.

JORDAN, DAVID STARR (1851-1931), American educator and scientist, was born at Gainesville, N.Y., Jan. 19, 1851. He graduated from Cornell University in 1872, from Indiana Medical College in 1875 and took his Ph.D. degree in 1878 at Butler University. While at Cornell he was an instructor in botany for one year, and was professor of biology at Butler University 1875-79. At the suggestion of Louis Agassiz, under whom he studied one summer, he made a study of fishes in the region of Massachusetts, and from that time on his interest in this field paralleled his interest in educational work. Jordan achieved great distinction in both. He was appointed professor of zoology at Indiana University in 1879 and from 1885-91 was president. He completely reorganized the university and during his administration made it one of the most progressive institutions of the day. His work here attracted the attention of Leland Stanford who was making plans for establishing a university in memory of his son. Jordan was asked to accept the presidency in 1891, which he held until 1913 when he was made chancellor. In 1916 he became chancellor emeritus.

From 1879-1908 Jordan was a member of the United States Fish Commission, was head of the Fur Seal Commission 1896-98 and in charge of the Salmon Commission 1880-1903. He was international commissioner of fisheries for the United States and Canada 1908-10. An ardent advocate of world peace, Jordan was made director of the World Peace Foundation 1910-14, and in 1915 president of the World's Peace Congress. In 1924 he won the peace award of $25,000 given by Raphael Herman for the most practical peace plan. Among his writings are *Fishes of North and Middle America,* 1896-1900; *Imperial Democracy,* 1899; *Democracy and World Relations,* 1918; and *The Days of a Man,* 1922. Jordan died in Palo Alto, Cal., Sept. 19, 1931. M. R.

JORDAN, SIR JOHN RUSSELL (1852-1925), British diplomat, born at Balloo, Ireland, Sept. 5, 1852. After studying at Queens' College, Belfast, he entered the British diplomatic service and was assigned as a student interpreter at the British Legation in Peking. During this period of service he became a master of spoken and written Chinese which, together with his keen interest in the people and developments in China, made him particularly popular with the Chinese leaders. In 1883 he was transferred to Korea, where he served as consul-general and, later, as chargé d'affaires and minister. He was knighted in 1904. When the Japanese assumed a protectorate over Korea, Sir John returned in 1906 to Peking as British minister. He held this post for 14 yrs., and during that interval established himself in

the minds of the Chinese and foreigners as one of the most constructive minded and fairest of the foreign diplomats who ever had served in China. He returned to England in 1920, and died Sept. 14, 1925.

JORDAN RIVER, a river of Palestine about 65 mi. long flowing from north to south into the Dead Sea. For over half its length the river is not navigable since it lies below sea level. The valley of the Jordan is mainly wilderness and Jericho is the sole settlement in the lower valley. The Jordan has been the historical dividing line between settled and wandering tribes and the crossing of the Jordan was epoch making in Israel's history.

JORGENSEN, JENS JOHANNES (1866-), Danish poet and biographer, was born at Svendborg, Nov. 6, 1866. As a student, he was an avowed freethinker and an enthusiastic follower of Brandes. At 30 he became a convert to the Catholic faith. His changed attitude was revealed in his collection of poems, *Confession,* and in *The Travel Book*. Besides many books of poetry and travel, he has written several biographies of the saints, *Francis of Assisi, Catherine of Siena* and others, and an autobiography, *The Legend of My Life.*

JORULLO, a dormant volcano in the state of Michoacan, Mexico. Its crater attains a height of 4,265 ft. above sea level and has been quiet since 1860 although smoke and steam still issue from fissures in the slopes. According to a legend, in 1759 this volcano came suddenly into being out of the flat surface of a sugar plantation. Following a rumbling of the earth, it rose in one great convulsion to a height of about 1,700 ft. and then burst, covering the surrounding country with rocks, ashes and molten lava. Since then intermittent eruptions of lava and scoriae have built it up to its present height. It is flanked by several other craters all of which have been simultaneously or alternately in a state of commotion for about 100 years.

JOSEPH, the son of Jacob and Rachel, whose story is told in the Book of Genesis, was sold by his brothers as a slave into Egypt. The account states that this misfortune befell him on account of their jealousy, because he was their father's favorite. In Egypt, his ability to interpret dreams brought him to the attention of Pharoah, who eventually raised him to the position of grand vizier or prime minister, in which he wielded immense power. His brothers and father eventually came to Egypt to buy food and the story of their meeting Joseph in the person of the great minister is one of the most charming narratives in the Bible. Modern scholars have tried to identify the pharaoh of the Bible story with the Hyksos, or shepherd king, Aphobis, and some students stress the legendary character of the stories, pointing out parallels in the Egyptian *Tale of the Two Brothers.* Such critics, without hesitation, call the story of Joseph's episode with Potiphar's wife an imaginary appendage and simply hold that he is the idealization of the progenitor of the tribes of Ephraim and Manasseh. Although such views must always be matters of dispute, it remains true that this Bible biography calls forth perhaps more admiration than is accorded to any other one of the Hebrew ancestors.

JOSEPH I (1676-1711), Holy Roman Emperor, was born at Vienna, July 26, 1676. In 1687 he was crowned King of Hungary and in 1705 was made Emperor. He supported the claims of his younger brother Charles to the throne of Spain in the WAR OF THE SPANISH SUCCESSION. He died in Vienna Apr. 17, 1711.

JOSEPH II (1741-90), Holy Roman Emperor, was born at Vienna, Mar. 13, 1741, the son of Emperor Francis I and Maria Theresa. In 1765 he succeeded his father as Emperor and as co-regent with his mother in the Hapsburg states. He became sole ruler at her death in 1780. He took his duties seriously and set about making the most sweeping reforms, including the abolition of serfdom, the proclamation of the "Edict of Tolerance" in 1781 and other innovations which led Pope Pius VI to go to Vienna to remonstrate. Although for the most part wise and enlightened, Joseph's reform measures were impractical in a state with so many different peoples and such divergent economic interests. Strong opposition developed, resulting in agitations and rebellion to sadden the later years of this enlightened despot. He died suddenly at Vienna, Feb. 20, 1790.

JOSEPHINE (1763-1814), first wife of Napoleon Bonaparte and first empress of the French, whose name was Marie Rose Tascher de la Pagerie, was born of a Creole family at Trois-Islets, Martinique, June 23, 1763. When a young girl she went to France and on Dec. 13, 1779 was married to Alexandre, Vicomte de Beauhairnais, who was executed in 1794 during the Reign of Terror. Two years later, on Mar. 9, 1796, she became the wife of Napoleon Bonaparte, then a young commander in the French Army. When Napoleon assumed the imperial crown at Notre Dame in 1804, she shared honors with him but their marriage had no issue and Napoleon's desire to found a dynasty led him to divorce her in 1809. Josephine lived unhappily at Malmaison near Paris until her death, May 29, 1814.

JOSEPHUS, FLAVIUS (37-100 A.D.), Jewish historian, was born at Jerusalem in 37 A.D. He was a member of the most aristocratic priestly family and on his mother's side was related to the house of Asmonaeans. In his youth he received a liberal education. He later joined successively the three main Jewish parties: the PHARISEES, the SADDUCEES and the ESSENES. These he joined in order to discover which was the best one, and finally chose the Pharisees. In the years 63-65 A.D. he went to Rome to plead for the imprisoned noble priests, who had been sent in chains to Nero. With the cooperation of Poppea, the wife of Nero, Josephus secured the liberation of the priests.

Josephus was very much influenced by the Roman culture, and the power of the Roman Empire made

a deep impression upon him. When he returned from his successful mission, he found the revolutionary movement in Jerusalem very active against the Romans. Fearing the rage of revolutionists because he might be suspected of siding with the Romans, Josephus and his sympathizers hid in the inner court of the Temple.

In Galilee. After the great victory of the revolutionists over Cestius, the Roman General, when the entire Twelfth Legion was almost annihilated, the revolt became very popular among the Jews. The principal men of the Jews, who were formerly against the revolt, joined the revolutionary forces, some by persuasion, and others for fear of appearing to side with the Romans. When the Provisional Government was established, under the leadership of the high priest, Ananias, Josephus was made General of the forces in Galilee, to conduct the war against the Romans. Unofficially, however, he was commissioned to go to Galilee, not to organize the defense against the Romans, but to disarm the rebels and to keep peace. Thus Josephus played a double rôle in Galilee. During the whole period of six months in Galilee, he saved his life and conquered his enemies by tricks and subterfuges.

His conduct in Galilee awakened the suspicion of the revolutionary leaders, particularly of John Gischala. In spite of the latter's attempt to have Josephus recalled, he continued to remain in Galilee. When Vespasian bore down upon Galilee with an army, in 66, Josephus was compelled, under the circumstances, to take command of the defense. Later he was deserted by most of his army, and he withdrew into the fortified town of Jotapata. He soon after surrendered to the Romans. Josephus was then brought before Vespasian. He predicted that Vespasian would shortly become Emperor.

Roman Citizenship. Henceforth, Josephus was in the Roman hands, first, as a prisoner, then as reporter, interpreter and mediator. One of the first acts of Vespasian's as Emperor, was the liberation of his Jewish prisoner, whose prediction had now come true. During the siege of Jerusalem, Josephus assisted Titus. He was constantly called upon by Titus to prevail upon the Jews to submit to the Romans. This was fraught with peril because he was despised by the revolutionists, and suspected by the Romans of treachery whenever they met with reverses. When Jerusalem was captured and the temple destroyed, Josephus was presented by Titus with a tract of land outside the city, and with a copy of the Scriptures. He also obtained the liberation of a number of his friends. He accompanied the conqueror to Rome, and witnessed the grand triumphal procession of Vespasian and his son, Titus. Roman citizenship and a pension were bestowed upon him and he assumed the family name of the Emperor, Flavian. During his long stay in Rome, from time to time he was accused of siding with the enemies of Rome, but he was always able to prove his loyalty to the Flavian family. Josephus died in 100.

Writings. *Jewish War,* the first work of Josephus, was written during the latter part of the reign of Vespasian. The purpose in writing this book was to discourage his countrymen from further revolt against Rome, and to give true facts of the struggle between the Jews and the Romans during the war. This book was endorsed by Titus for its accuracy, and placed in the libraries of Rome. *Antiquities of the Jews,* written in 93, is the Magnum Opus of the author. This work consists of 20 books and 60,000 verses. It begins with the narrative of the creation of the world, and continues to the Jewish revolt against Rome. The passage containing the story of Jesus's condemnation by Pilate was considered authentic up to the 16th century. From then up to the present time its authenticity has been disputed. Because of these Christian references Josephus's works have been preserved by the Church. Josephus's motive for writing *Antiquities* was the hope of softening the animosity which the Jews had developed toward him, and he also desired to show that his race, the Jews, was older than the Roman, and that its history was equally glorious. *The Life* is a small monograph and is appended to the *Antiquities.* In it Josephus endeavors to disprove all the accusations which were brought against him by the Jewish historian, Justus of Tiberias.

Against Apion, divided into two books, is an attempt to remove the prejudices and to deny the accusations of the Anti-Semites of his day, as well as of those of former generations.

Josephus's works were translated into practically all the languages. Of English translations, the best known is Whiston's, revised by Shilleto, 1889-90.

S. Z.

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JOSH BILLINGS. *See* SHAW, HENRY WHEELER.

JOSHUA, the attendant and successor of Moses as leader of the Israelites from the wilderness to the promised land of Canaan, was the son of Nun, of the tribe of Ephraim, and one of the two spies who reported favorably on Canaan. He was at first called Hoshea, but his name was changed by Moses. Many modern scholars who see in Joshua a legendary rather than a historical character, think Hoshea the more historical of the two. Joshua, they point out, was of Joseph's descendants, died at the same age of 110, and possessed a name composed of the names of a son of Moses and a son of Aaron, while the name of his "inheritance" was Timnath-Serah, which meant "portion of the sun." Such points are thought evidential of a solar heroic legend, mixed with Hebrew myths to give a romantic glamor to the entrance into Canaan. Whether such interpretations will generally take the place of the thrilling stories of the conquest of Canaan, the fall of the walls of Jericho and the sun's "standing still," as set forth in the Bible, only time will tell.

JOSHUA, BOOK OF, one of the early historical books of the Old Testament, is named after Joshua, the son of Nun. He succeeded Moses as leader of the Israelites in their journey through the wilderness to Canaan. The book consists mainly of stories relating to their settlement there and the completion of the migration which began with the Exodus from Egypt. Many scholars to-day think that the book is compiled chiefly from the same sources as the five preceding books of the Bible, and for that reason it is sometimes classified as the last book of the Hexateuch, and given a late date in the 5th century B.C. The more conservative believe that it was compiled from Joshua's own records or from the personal knowledge of one of his contemporaries, and that its miraculous elements may be subject to rationalization. The book falls naturally into two parts: (1) Chapters 1 to 12, relating to the invasion and conquest of Canaan, and (2) the allotment of territory to each of the tribes. Among the familiar stories in the book are, the collapse of the walls of Jericho, the standing still of the sun, and the rise of the Gibeonites. It closes with Joshua's parting admonitions.

JOSHUA TREE, a weirdly branching woody species of YUCCA (*Yucca brevifolia*), sometimes called Joshua yucca and yucca cactus. It is a native of highly arid districts from southwestern Utah to the western and northern borders of the Mohave Desert in California. The tree, which sometimes rises 50 to 60 ft. high with a trunk 2 to 3 ft. in diameter, bears stout, widely forking branches, rigid, narrow, sharp-pointed leaves, and conspicuous clusters of large, waxy, greenish-white flowers, blossoming from March until May. In the dry capsular fruit are borne numerous large seeds, used for food by the Indians. The soft, spongy wood, though sparingly utilized, is of little value.

JOUBERT, JOSEPH (1754-1824), French writer, was born at Montignac, Périgord, May 6, 1754. In 1778 he went to Paris, where he attached himself to DENIS DIDEROT and d'Alembert, steeping himself in the advanced ideas of the time. During the French Revolution he was elected judge by his fellow-citizens at Montignac. Subsequently he entered Chateaubriand's circle, and died at Paris, May 3, 1824. In 1838 Chateaubriand collected the *Pensées* of Joubert.

JOULE, JAMES PRESCOTT (1818-89), English physicist, was born at Salford, Dec. 24, 1818. Early scientific study convinced him of the need of minute quantitative precision. He discovered the relationship between heat and energy and formulated the first law of thermodynamics. Joule also worked on temperature changes in gases undergoing compression and flowing in a nozzle, and upon the compression and tensions of solids. He discovered and outlined methods of surface condensation of steam, improving the efficiency of steam engines. The joule, the unit of work, is named after him. He died at Sale, Oct. 11,

JOULE. *See* WORK.

JOULE MAGNETOSTRICTIVE EFFECTS. *See* MAGNETO-MECHANICS.

JOULE'S LAW, a law of physics stating that, when a gas expands adiabatically (*see* ADIABATIC PROCESS) without doing external WORK, no change in temperature occurs. This holds only for a "perfect" gas; all actual gases depart from it more or less. Another statement of this law is that the internal energy of a perfect gas depends only upon its temperature.

JOULE-THOMSON EFFECT. No actual gas meets exactly the requirements of BOYLE'S LAW and JOULE'S LAW. Joule and Thomson (*see* KELVIN), by an elaborate series of experiments, studied the changes in temperature which occur when actual gases pass through a "porous plug." A "perfect" gas would pass through the plug without change in temperature, but any actual gas shows a small change, usually a COOLING EFFECT, known as the Joule-Thomson effect. The data on this effect are highly important in indicating the exact properties of gases. The cooling effect is the basis of the regenerative process for liquefying air.

W. W. S.

JOURNAL. *See* BEARINGS.

JOURNALISM, SCHOOLS OF, in the United States trace their beginnings back to classes in journalism which Gen. Robert Lee introduced in 1869 in Washington College, now Washington and Lee University, when president of that institution. At about this time Whitelaw Reid of the *New York Tribune* was advocating schools of journalism and Andrew D. White was attempting to introduce journalism courses in Cornell University. The general attitude of editors and publishers was that journalism could be learned only in newspaper offices, and this opinion prevailed until about 1890. In 1893 Joseph French Johnson, formerly with the *Chicago Tribune,* gave courses in newspaper practice, current topics, history of journalism and newspaper making at the University of Pennsylvania. In 1903 JOSEPH PULITZER offered $2,000,000 to Columbia University to found a school of journalism with the provision that the advisory board was to be "composed of the foremost journalists and editors possessing knowledge on the subject." The school was opened in 1912. Four years earlier the Missouri School of Journalism was established and about the same time courses given at the universities of Illinois, Indiana, Kansas, Virginia, Washington and Wisconsin. To-day journalism is taught in over 200 universities and colleges, many of these maintaining separate schools or departments of journalism. The subject is also taught in many high schools. M. R.

See J. M. Lee, "Instruction in Journalism in United States," in the United States Bureau of Education *Bulletin,* 1918 No. 21.

JOURNEYMAN, one who has become skilled at a certain kind of work; a laborer who has completed his APPRENTICESHIP but has not yet become a master of his trade. Until late in the Middle Ages the term was applied to all laborers who worked by the day.

JOUSTS, or tournaments, military exercises carried out for practice and to display individual prowess. Jousting was a favorite knightly sport from the 11th through the 17th centuries. Mounted opponents galloped forward from opposite ends of the lists, trying to

unhorse each other with their heavy tilting spears. Although in many tournaments, wooden swords and other mock weapons were used, many knights were killed or injured. In the early 14th century, elaborate rules regarding weapons were formulated. Spear points were blunted, and pointed swords or daggers were forbidden. Heavy jousting armor, especially designed to deflect weapon strokes, protected the knight. About this time the tilt developed from a strip of cloth into a stout wooden barrier four feet high, stretching the length of the lists and separating the two contestants so that the horses could not collide. In the 15th and 16th centuries, the jousts held by princes and great nobles became elaborate pageants, sometimes lasting several days.

JOVANOVIC, JOVAN (1833-1904), Serbian poet, journalist, humorist and dramatist, whose pen name was Zmaj, was born at Novi Sad or Neusatz, Serbia, Nov. 24, 1833. The pseudonym of Zmaj, or The Dragon, came from the name of his successful paper. Jovanovic studied law and practiced his profession in his native town, but later took up medicine and practiced as a physician in Belgrade and Vienna. Representative of his poetry is the volume entitled *Withered Roses.* His most typical play is the popular farce, *Saran.* Jovanovic died in Belgrade, Serbia, in 1904.

JOVE, in Roman mythology, another name for the god of Olympus, JUPITER.

JOWETT, BENJAMIN (1817-93), English scholar and theologian, was born at Camberwell, Eng., Apr. 15, 1817. He graduated from Balliol College, Oxford, in 1839 and was a fellow and tutor there until 1870 when he was made master of the college. Under his influence Balliol College, which had lost its early prestige, again became prominent. Aside from his connection with the college, he was famous for his translation of Plato's *Dialogues* and the *History of Thucydides.* He died at Headley Park, Eng., Oct. 1, 1893.

JOYCE, JAMES (1882-), Irish novelist, was born in Dublin, Feb. 2, 1882. He was educated at Clongowes Wood College, Belvedere College, and at the Royal University, Dublin. His first prose, *Dubliners,* a collection of tales and sketches, was published in 1914, and was followed two years later by a novel, *Portrait of the Artist as a Young Man. Ulysses,* a book which introduced a new note in the technique of the novel, was published in Paris, 1921. Joyce has published a play, *Exiles,* and among his poetry is the volume, *Chamber Music.*

JOYNSON-HICKS, SIR WILLIAM (1865-), British statesman, was born June 23, 1865. He became a solicitor and practiced in London. He entered Parliament and served in several ministries. He was created a baronet in 1919 and a viscount in 1929.

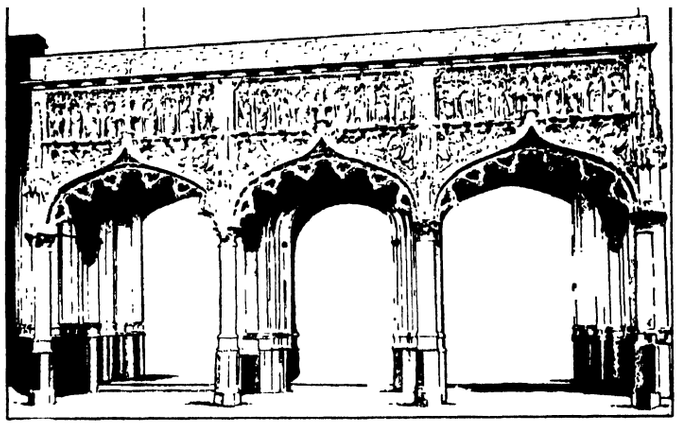
JUANACATLAN FALLS, a fall of water often called the Mexican Niagara, occurring on the Rio Grande de Santiago in the state of Jalisco about 20 mi. southeast of Guadalajara. It is a horseshoe shaped cataract, measuring 524 ft. from tip to tip, with a height of 70 ft. and having a variable volume. During the rainy season a heavy sheet of brown water falls with a deafening roar into the basin below but in the dry months the volume shrinks until the edges of the precipice protrude in many places and divide the cataract into 20 or 30 narrow falls. Its water power has been developed to furnish electricity for the city of Guadalajara.

JUAN FERNANDEZ, also called Mas-á-Tierra, an island of the Pacific Ocean, about 400 mi. off the coast of Chile, of which it is a possession. The island is 18 mi. long and 3 mi. wide, the surface being a series of volcanic rocks, the highest of which rises 3,225 ft. above the water. Alexander Selkirk, a Scotchman, is supposed to have led a solitary existence here for four years and his adventures are usually believed to be the basis of Defoe's *Robinson Crusoe.* There are only about 300 inhabitants.

JUAREZ, BENITO PABLO (1806-72), Mexican statesman, was born of Indian parents on Mar. 21, 1806, in San Pablo Cuelato, Oaxaca. Despite the indigence of his family he was able to secure a fine education and in 1828 he was appointed professor of experimental physics at the Oaxaca Institute of Arts and Sciences. In 1834 he graduated in law, practicing from then on. His political life began with the governorship of his native state, and in the subsequent election he represented it as deputy in the National Congress. In 1855 he became the president of the Supreme Court of Justice, in which capacity he began to strike at privilege and to institute the reforms he stood for—the Law Juarez of 1855 abolished privilege by suppressing the special courts. Juarez was instrumental in bringing into existence and adoption the famous liberal constitution of 1857, which persisted until 1917. Its promulgation inaugurated the War of the Reform, since it struck at the clergy and military, the two strongest props of the conservative régime. Juarez refused to recognize General Zuloaga, who had overthrown the constitutional president, and for three years, as the head of the reform party, he defended his constitution, with Vera Cruz as his headquarters. In 1861 he and his troops entered Mexico City, where he put into effect anti-clerical laws he had issued earlier and became constitutional president. But he immediately fell afoul of the European creditors of Mexico, on whose loans he was forced to suspend payments, and the French occupied Mexico and set up as emperor Maximilian of Austria. Juarez, however, kept up a stubborn resistance and finally captured and executed Maximilian in 1867. Juarez was elected president again in that year and he immediately reduced the numbers and strength of the enemy. In the election of 1871 he was opposed by Lerdo de Tejeda and Porfirio Diaz but was acclaimed president by Congress, which cast the deciding vote in an election which had not given any of the candidates the requisite majority. Diaz revolted and Juarez sought to put down the revolt, but he died on July 18, 1872, of an illness he had long suffered from. Juarez is one of Mexico's greatest heroes. P. V. S.

JUBBULPORE or **JABALPUR,** the name of a city, district and division in the Central Provinces, British India. The city, a junction of the East Indian and Great Indian Peninsula railways, is the headquarters of the district and division. Unusually attractive, it manufactures pottery, cotton goods and glass. The fertile district of Jubbulpore mainly produces wheat. Iron and manganese ores are mined. The chief river, the Nerbudda, is considered sacred at several points. Area 3,912 sq. mi. The division of Jubbulpore has an area of 18,950 sq. mi. Pop. 1921, city, 108,793; district, 745,685; division, 2,421,000; 1931, city, 124,469; district, 756,346.

JUBE, in early Christian churches, an elevated tribune dividing the nave from the choir and used as a special pulpit, from which the bishop preached and the scriptural lessons were read. In the 13th century the jube became primarily a screen enclosing the choir, and it is in this sense that the term is generally



A FINE EXAMPLE OF A JUBE OR ROOD SCREEN, ST. PETER'S CHURCH, LOUVAIN, BELGIUM

used. In English churches the jube became known as the rood-screen, from the crucifix, or rood, which hung above it. The largest and most elaborate jube in France is that of the cathedral of Albi, about 1500. Another example of great richness is the early Renaissance Jube of the Church of St. Étienne du Mont, Paris, 1600-05, by Biard.

JUBILEE or **JUBILE, YEAR OF,** the last year in each cycle of 50 years, supposedly according to the old, traditional Hebrew calendar; hence, in modern parlance, the application of the term, Jubilee Year, to every 50th anniversary of any memorable event or of any institution. The name, Jubilee, it is generally assumed, and undoubtedly correctly, is derived from the Hebrew word, *yobel,* meaning ram, for the proclamation of the Jubilee Year was commanded to be by means of publicly blowing the ram's horn upon the new year's day, upon the 10th day of the seventh month.

Nature and Purpose. The legislation for the Jubilee Year is found in the Bible in Leviticus 25:8-55; 27:16-25. It was altogether a social institution, designed to protect the Jewish people from the danger and attendant circumstances of extreme poverty, and particularly from the evils of permanent class distinctions and social injustice and oppression of the poor by the rich and the enforced and permanent enslavement of the former. Its underlying principle is that all land belongs in reality to the Deity, and that accordingly men, and particularly the Jewish people, dwell upon it only through His sufferance, as His tenants, as it were, or as "strangers and sojourners with Him." He has assigned to each family a specific bit of land, to till and to provide it with sustenance. This piece of land is the family property or estate, permanent and inalienable and to be inherited from one generation to the next. Therefore it may not be sold, but at the most it may only be leased, and that only for a period enduring till the advent of the Jubilee Year. Then all land reverts automatically to its original and permanent owners, and thereby their primal dignity and economic security as landowners and responsible citizens of the state are restored. Thus the institution of the Jubilee Year, it was anticipated, would effectually prevent permanent, or even too long protracted poverty and enslavement.

In leasing a piece of land, the number of years until the Jubilee Year, with its automatic termination of all leases, was to be reckoned carefully and the leasing price or rental fixed accordingly. Furthermore, the original owner retained the right to cancel the lease at any time before the advent of the Jubilee Year by repayment of the full rental for the years still remaining until the Jubilee Year. Houses in a walled city might be sold in perpetuity, although the original owner retained for a year the right to redeem his property and cancel the sale. But houses in open villages were to be regarded as a part of the land, and so, like the land, could be leased only until the Jubilee Year.

Also, if a man exhausted the rental of his land, and in addition thereto became so impoverished that he had to borrow money, no interest whatever was to be demanded of him. And, while it is not explicitly stated, the clear implication of verses 35-38 is that with the advent of the Jubilee Year all debts were automatically canceled; otherwise the return of the family estate to the original owner would have merely made possible the repayment of debts, but would not at all have restored the family to economic independence, and thus the primary purpose of the Jubilee Year would have been frustrated. Likewise the Jubilee Year automatically brought manumission of all Hebrew slaves, who had been forced into the servile state through extreme poverty, and their restoration to their families and their ancestral estates.

All this legislation with regard to the Jubilee Year is a part of the so-called Priestly Code, the very latest stratum of the Hexateuch. Except for a vague and obviously spurious and late passage, Ezekiel 46:16-18, the Jubilee Year is not referred to even once in any other portion of the entire Bible. This silence is most significant. The description of the release of the Hebrew slaves in Jeremiah 34:8-22 shows that in the late pre-exilic period of Israelite history (pre-

vious to 586 B.C.), only the Sabbatical Year was observed, and that the Jubilee Year was as yet unknown. Moreover, Nehemiah 5:1-13, which deals with the problem of the relief of the extreme economic impoverishment of the people, seems to disregard the institution of the Jubilee Year completely, quite as if it too knew absolutely nothing of it. On the other hand, the fact that Leviticus 25:9 fixes the new year's day upon the 10th of the seventh month, and not upon the first of that month, as did the latest Jewish calendar, establishes conclusively that this institution of the Jubilee Year must have been conceived and much of the legislation for it formulated before the end, and perhaps even before the middle of the 4th century B.C. On the other hand, since the institution was apparently still unknown to Nehemiah, about 432 B.C., it follows that this legislation must have been formulated at about the end of the 5th and the beginning of the 4th centuries B.C.

Utopian Scheme. Furthermore, a moment's thought will show that not a few of the provisions of the Jubilee legislation, those for the automatic cancellation of debts for example, were absolutely impracticable and impossible of fulfillment. Also all of the extensive post-Biblical Jewish literature records not a single authenticated instance of the observance of a Jubilee Year. Accordingly the ancient rabbis and modern Biblical scholars are almost unanimously agreed that the entire institution of the Jubilee Year was purely theoretical, that ethically exalted though its underlying principle was, it was altogether impossible of fulfillment and that in consequence the Jubilee Year was never really observed, that it was a purely utopian scheme, one of the very first of its kind in all literature. This concept of the Jubilee Year every 50th year must have evolved out of the practice, or, perhaps better, out of the theory of the older Sabbatical Year, and may perhaps have been designed in part to correct some of the faults or impracticabilities of that institution, particularly as they might have applied to the greatly changed conditions of the late post-exilic age. The Jubilee legislation of Leviticus 25 must have been inserted in its present place quite late and as an appendix to the older legislation in verses 1-7; 19-22 dealing with the Sabbatical Year. No doubt this was partly because, as is self-evident, the idea of the Jubilee Year is nothing but a theoretical extension of the institution of the Sabbatical Year every seventh year, viz., a cycle of seven Sabbatical Year periods, or 49 years, with the next year, the 50th, celebrated as the culmination of a similar, though larger, period, the Jubilee, and partly also because the new legislation of the Jubilee Year and particularly that for the manumission of slaves and cancellation of debts in the Jubilee Year, was expected to supplant the older legislation providing for the manumission of slaves and cancellation of debts in the Sabbatical Year. (Exodus 21:2-6; Deuteronomy 15.)

But while it is almost certain that the Jubilee Year was never actually observed, none the less it did exert a certain influence upon post-Biblical Jewish tradition and literature, in that it called into being a very interesting and important pseudepigraphical writing, the so-called BOOK OF JUBILEES. J. Mo.

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JUBILEES, BOOK OF, one of the books of the Pseudepigrapha, originally composed in Hebrew. It is called also *Little Genesis* or *Apocalypse or Testament of Moses.* The Book of Jubilees consists of 50 chapters, and is written in the form of an apocalypse. It amplifies and supplements the Biblical narratives by the inclusion of addresses and legendary additions. The book owes its name to the fact that the events narrated are divided up into years; weeks of years, or groups of seven years each, and jubilees, or groups of seven year weeks of seven years each, *i.e.,* of 49 year periods. Its apocalyptic nature consists in the fact that the book claims to be a revelation made by God to Moses on Mt. Sinai through the intermediacy of the divine angel at the same time as was the Written Law. However, the book states that the revelation contained in the Book of Jubilees was not disclosed to the people at large, but was reserved for the great and holy men of each generation.

Great differences of opinion exist as to the time of composition of the Book of Jubilees. Estimates range from the 4th century B.C. all the way to about the end of the 1st century A.D. It is to be noted that the book contains no mention of the destruction of the Second Temple in 70 A.D.; hence it might appear that the book was written before then. Some scholars are of the opinion that the most probable time of its composition was about 100 B.C., shortly before or at the time of John Hyrcanus. Both Palestine and Egypt have been advanced as the country of its origin. A widely accepted view has it that it was written in Palestine by a Jew who had before himself a Hebrew text of the Bible, which he followed in writing.

At present the complete text of the Book of Jubilees exists only in an Ethiopic translation made on the basis of the Greek translation. Both the original Hebrew and the Greek text, however, are no longer extant. Incomplete Latin and Syrian texts or fragments also are extant; the original Hebrew text was first translated into Greek, and then from Greek into Latin and Ethiopic.

The contents of the book are briefly as follows: God commands the angel of His presence to recount to Moses the entire course of history, and enjoins upon Israel the observance of the Passover and the Sabbath. Fifty Jubilees of 49 years each, i.e., 2,450 years in all, are reckoned from the creation of Adam to the crossing of the Jordan under Joshua. Utterances concerning the angels, the demons, Satan, and the tortures of hell are made, and the laws of the Sabbath are expressly stated. The story of Enoch (Genesis 5:21-24) is greatly amplified and embellished with

legends, and many laws which were believed to have been given to Israel on Mt. Sinai, including the laws of the festivals, are represented as having been enjoined upon Israel and practiced during the period before Moses. The book denies bodily resurrection. Israel is to be the ruler of the world in the future, just as Rome (Edom) is portrayed as being dominated by Israel in the present.

The Book of Jubilees deliberately omits all Biblical narratives which are in the least derogatory to the character of any of the patriarchs, at the same time ascribing to Satan all such acts the author considered unworthy of God himself. A. Sh.

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JUDAEO-PERSIAN, a form of modern Persian spoken by Jews in Persia, in Bukhara and along the western coast of the Caspian Sea. Its literature consists of translations from the Bible and of liturgical and poetical works, all written in Hebrew characters, its dialects varying somewhat according to locality. It frequently retains archaic features in phonology and morphology, and especially in vocabulary.

JUDAEO-SPANISH (Ladino), a form of Spanish spoken in numerous dialects by the descendants of Spanish Jews in Africa, Palestine, Turkey and the Balkan countries, formerly also in the Netherlands. It possesses a considerable literature, both religious and secular, written either in Hebrew or Latin characters. The language is Spanish, chiefly Castilian, of the 15th century, largely interspersed with Hebrew. Traces of a similar Judaeo-Portuguese still exist in Holland and at Hamburg.

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JUDAH ALHARIZI. *See* Harizi, Judah ben Solomon.

JUDAH HALEVI (c. 1080-c. 1141), renowned Jewish poet and philosopher of religion, was born in Toledo, Spain, about 1080 (according to others, in 1086). Both the exact year of his death and the site of his grave are unknown.

Halevi's most famous work was his *Kuzari.* It represents an apology for Judaism, which, he maintained, came into existence through divine revelation, and was attested by many miracles which occurred in the presence of multitudes of people.

All of Halevi's poems were written in Hebrew. He is generally deemed to have been the greatest Hebrew poet of post-Biblical times, by reason of the classic Hebrew language of his poetry, his intense national and religious spirit, and his yearning for the ancient Jewish homeland and for the Holy City which he expressed therein. The *Zionide,* or *Ode to Zion,* which was incorporated into the liturgy (Kinoth) for the Ninth of Ab (Tishah Beab), and others of his songs of Zion are his most famous and beautiful in this field. Others of his poems have as their themes the basic doctrines of Judaism. Many of the hymns which he composed now form a part of the Jewish synagogal service, and he wrote, in addition, love poems and marriage songs. A. Sh.

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JUDAISM, the religion of the Jewish people, began with the reorganization of the religion of ancient Israel after the Babylonian exile in 444 B.C. It took over a body of teachings contained in the sacred scriptures. The Toral, or Law, was accepted as the guiding rule of life. The ritual of ceremony and of sacrifice became a holy memory, and in their place was offered a reinterpretation of the theological ideas and instructions of the past in the light of the teachings of the prophets. Micah's query, "What doth the Lord require of thee but to do justly, to love mercy, and to walk humbly with thy God?" became the basis of the new religion. Not sacrifice but righteous conduct is stressed.

As a monotheistic religion the adherents of Judaism do not merely profess their belief in the unity of God, but consider themselves the guardians of that faith. No compromise with polytheism or idolatrous heathenism is possible. Judaism proclaims the universality of its God. He is the God of man from the very beginning; the creator of heaven and earth, and the supreme and eternal ruler of the universe. He is the God of righteousness and holiness, the ideal of moral perfection.

As a universal religion Judaism, unlike other religions, does not present a creed or a system of beliefs, upon the acceptance of which depends the redemption or future salvation of its adherents. It is a system of righteous conduct. It is a law "for life and not for the depriving of man's life," said an eminent rabbi of old. It is a religion of justice. It demands righteousness and compassionate love for the oppressed, the subdued and the poor, the widow and the orphan, the homeless and the stranger. Sympathy is required not only for the helpless, but even for the criminal. Truth is likewise emphasized. Judaism maintains that its God is the God of truth (Jeremiah 10:10). It is the constant search for truth which distinguishes the theology of Judaism from that of other religions. It fosters education and culture, making it a duty for parents to educate their children and for the community to provide for the general instruction of old and young. It sanctifies labor and urges the acquisition of a trade whereby one may earn a livelihood. Celibacy is unlawful, and each man is enjoined to build a home, and thus contribute to the welfare of human society. Patriotism is strongly stressed. Love of one's country and loyalty to its Government is a duty which no adherent of Judaism can shirk.

As a religion of joy Judaism does not encourage ascetic practices. It desires that man should enjoy the gifts of God, and at the same time contribute to the joy of others. Its sabbaths and festivals are days of joy with no austerity about them. As a religion of optimism and hope it looks upon the moral and spiritual advancement of mankind as the manifesta-

tion of God's plans of wisdom and goodness. Holiness is a noble idea which characterizes Jewish religious life. Judaism teaches that the whole of life is holy. "Be holy for the Lord your God is holy" (Leviticus 19:1). It does not judge men by their creeds, but by their deeds, believing that "the righteous of all nations have a share in the world to come."

Judaism has no sacraments in the sense of mysterious rites whereby one is brought into bodily relationship to God. The Sabbath and the festivals, with all the ceremonies connected with them, are characteristic expressions of Jewish religious sentiment. They are important factors in the advancement of Jewish religious life.

At all times Judaism seems to have presented two currents of thought running parallel to each other: the conservative and the progressive, but both concerned with the continuity of the teaching of historic Judaism. The adherents of the religious teachings of Judaism in western lands are divided into three major groups: Orthodox, Conservative and Reform. When, in the early days of the 19th century, the reform movement made its appearance in Jewry it expressed a certain desire to free Judaism from certain burdensome customs and ceremonies which clustered around it, to restore it to its pristine character, and to provide it with a new philosophical basis. The opponents of the movement, who insist upon the maintaining of existing conditions in the religious life of the Jews, designated themselves as Orthodox, i.e., adherents of the "correct" or transmitted traditions and practices. Those, on the other hand, who sought a middle ground between the Old and the New Judaism, and who were willing to accept minor changes in Jewish communal and religious life, came to be known as Conservatives to differentiate them from those Jews who are described as Orthodox and as Reform. These Conservatives, notwithstanding all adherents of Judaism, share in the common heritage of faith and the common will to live as one people. The conviction that all Jews of whatever land or tongue are brothers in blood and in faith has remained unshaken through centuries of trial and tribulation. Judaism represents the spiritual fatherland and bond of union of an ancient but dispersed people. J. Bl.

JUDAS ISCARIOT, "the most detested man in the history of Christianity," was chosen by Jesus as one of his disciples. The surname Iscariot means according to some "of Kerioth," or, say others, "of Jericho." He is thought to have been the only Apostle not a Galilean. Of his early history nothing is known. The fourth Gospel relates how he complained at Mary's costly gift of spikenard to anoint Jesus, and adds, "Judas was a thief, and having the box, took what was put therein." His betrayal of Jesus to his enemies for "thirty pieces of silver," is humanely explained by Luke as happening because "Satan entered into him." Two accounts of his death are given in the New Testament, both of which appear to have been prompted by a desire to fulfill prophesy or to explain the origin of "the field of blood." Mark and John are silent on his death.

JUDAS TREE (*Cercis Siliquastrum*), a handsome small tree of the pea family native to southern Europe and western Asia, widely planted as an ornamental. In size it ranges from a shrub to a tree 40 ft. high. It bears very smooth, shining, roundish leaves, clusters of purplish-pink flowers and a long thin flattened pod. In various legends this attractive tree shares with the elder the ignominy of being that on which Judas hanged himself. *See also* Redbud.

JUDD, CHARLES HUBBARD (1873-), American psychologist and educator, was born at Bareilly, British India, Feb. 20, 1873. He came to America in 1879. In 1894 he graduated from Wesleyan University and in 1896 took his Ph.D. at the University of Leipzig. He was instructor of philosophy at Wesleyan 1896-98, professor of psychology at New York University 1898-1901 and at the University of Cincinnati 1901-02. From 1902-09 he was successively instructor, assistant professor, professor and director of the Psychological Laboratory at Yale. In 1909 he became professor of education and director of the School of Education at the University of Chicago. Among his writings are *Genetic Psychology for Teachers,* 1903; *Introduction to the Scientific Study of Education,* 1918, and *Psychology of Secondary Education,* 1927.

JUDD, ORANGE (1822-92), American agricultural writer, was born at Niagara Falls, N.Y., July 22, 1822. He graduated in 1847 from Wesleyan University, Middletown, Conn., and later studied agricultural chemistry at Yale. Beginning in 1853, for 30 years he edited *The American Agriculturist,* and in 1855-1863 edited the agricultural section of the New York *Times.* In 1888 he began publishing the *Orange Judd Farmer,* and *Hearth and Home.* He died at Evanston, Ill., Dec. 27, 1892.

JUDE, ST., or St. Judas, not to be confused with Judas Iscariot, was one of the Twelve Apostles, and brother to James the Younger. Practically nothing is known of his personality, and the oldest Syriac tradition identifies him with the Apostle Thomas. (*See* Thomas, Saint.) The last book but one in the New Testament is attributed to him, and if its 25 verses give any indication of his character, he was a great opponent of mere professional religion. Some scholars, however, believe that this letter is the work of a post-apostolic age. Jude is reported by tradition to have evangelized Mesopotamia and afterwards to have accompanied Simon the Canaanite into Persia, where they crowned their labors with joint martyrdom. Others affirm that he died a martyr in Armenia, or at Berytus, or at Aradus, 80 A.D.

JUDE, GENERAL EPISTLE OF, the last book but one in the New Testament, contains only 25 verses. The book states that it was written by "a brother of James," who was thought by the early church to be the James called "the brother of the Lord." In the 17th verse reference is made to "words which have been spoken before by the apostles,"

which some scholars view as evidence of post-apostolic authorship. They also think that the licentiousness rebuked in this epistle can apply only to forms of Gnosticism of the 2nd century. The abiding value



JUDAS THADDEUS (ST. JUDE)
From an engraving by the German master, "E. S."

of the letter lies in its condemnation of mere professional religion and its fine doxology.

JUDGE, an official who presides and administers the law in a court of justice. In England down to 1688 the judges were appointed by the King to serve during his pleasure. Since 1688 they have been appointed by the King for life or during good behavior. In the United States federal judges are appointed by the President with the advice and consent of the Senate and hold for life. In a few states the judges are appointed by the Governor for life, in others by the legislature for life or fixed terms. But in the majority of states since 1850 judges have been elected in too many states for short terms.

JUDGE ADVOCATE GENERAL, U.S. ARMY. The Judge Advocate General's Department, U.S. Army, consists of commissioned officers trained in the law as well as in the military profession. The head of the department, the Judge Advocate General of the Army, is the legal adviser of the Secretary of War, the Assistant Secretaries of War, the Chief of Staff of the Army, the chiefs of the various bureaus of the War Department, the chiefs of the several branches of the Army, and, in general, the entire military establishment. He advises concerning the legal correctness of military administration, embracing disciplinary action, matters affecting the rights and mutual relations of the personnel of the Army and the contractual and other business affairs of the War Department and the Army, including the Regular Army, the National Guard in its Federal relations and the Organized Reserves. His office is one of the bureaus of the War Department.

Every record of trial by general court-martial undergoes what is in effect an appellate review in the Judge Advocate General's Office. His office is by law invested with authority to initiate corrective action in case of legal error.

The Secretary of War is not only the executive head of the War Department but is invested with additional powers. For example, he exercises administrative supervision over the government of the Canal Zone and has far-reaching powers and important functions in connection with the navigable waters of the United States, the bridging of navigable streams, river and harbor improvements and flood control. Legal questions arising in the course of the exercise of such powers increase the demands upon the Judge Advocate General's Office and increase correspondingly its opportunities to render service. For the corresponding naval office *see* NAVY, U.S., ACTIVITIES OF.

E. A. K.

JUDGES, BOOK OF, in the Old Testament, is so named because it gives the history of the rule of certain chiefs or deliverers, called judges in ancient Semitic communities. It covers the transition years between the settlement in Canaan and the establishment of a stable government and, according to the chronology of the book, covers a period of 410 years. The most famous of the judges are Deborah and Barak, Gideon, Jephthah, Samson, Eli and Samuel. Some scholars view its narratives as local traditions, the Jephthah stories coming from Mizpeh, the Gideon stories from Ophrah, etc., and think them compiled and edited at a much later date than was formerly believed. The book falls naturally into three parts: (1) Chapters 1:1 to 2:5, giving a summary of the entrance into Canaan, with accounts of lapses to the religion of the Canaanites; (2) 2:6 to 16:31, containing narratives from the death of Joshua to the death of Samson; and (3) 17 to 21, an appendix narrating events in the same period without naming any Judge. However viewed as to date and authorship, the book is a picture of the religious and social conditions of the period, and stresses certain glorious moments in Hebrew history.

JUDGMENT, the official decision of a court or other properly constituted tribunal upon the issues brought before it in an orderly litigation. Judgments may be *in rem,* that is, determining rights as to property or the status of persons binding upon the whole world, or, in *personam* binding only a particular person and those in relation to him or succeeding to his rights. Also they may be final, that is, terminating the proceeding, or interlocutory, that is, establishing the claim or right of the party or of the parties in general terms, or determining some preliminary or subordinate point without determining the ultimate rights of the parties or disposing finally of the case.

JUDICIAL SETTLEMENT, the method of deciding international disputes by the application of principles or rules of law. Thus, a decision by the Permanent Court of International Justice is judicial in

character, the Court normally applying "the general principles of law recognized by civilized nations." This method is to be distinguished from the diplomatic method which aims at an adjustment or compromise of a controversy without necessarily applying any legal principle. F. M. R.

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JUDITH, BOOK OF, one of the apocryphal books of the Old Testament which is received in the Roman Catholic canon. The book is held by the Latin Church to have been written by the High Priest Eliachim. It obviously takes its name from the heroine, a Jewess, who, in order to deliver her native city from the siege of Holofernes, an Assyrian general, entered the enemies' camp, under pretense of wishing to betray her city, and gained admission, by her beauty, to the tent of Holofernes, whom she slew in his drunken stupor. Many modern scholars hold that it is a romance from the Hebrew, dating from the Maccabean period.

JUDSON, HARRY PRATT (1849-1927), American educator, was born at Jamestown, N.Y., Dec. 20, 1849. On graduating from Williams College in 1870, he taught in a Troy, N.Y., high school and was later principal. In 1885 he was made professor of history at the University of Minnesota, leaving in 1892 to go to the University of Chicago as head of the political science department and dean of the faculties of arts, literature and science. In 1906 he was made acting president and in 1907 president of the university, serving until 1923. In 1914 Judson went to China to investigate conditions for a group of American philanthropists, and in 1918 was head of the American Commission for Relief in Persia. He died at Chicago, Ill., Mar. 4, 1927.

JUGGLING, the performance of feats of dexterity depending chiefly on manipulation. With a history extending back many centuries before recorded times, the art of juggling was probably known to performers among the early East Indians, Persians, Tibetans, Chinese and Japanese. In much later times, these feats were a favorite source of entertainment with the Greeks and Romans. Montezuma II (1466-1520), Aztec emperor of Mexico, employed the most dexterous jugglers to perform at his magnificent court entertainments. In the modern and professional sense of the word, juggling is a feat generally restricted to the theater, circus and country fair, where performances may include such feats as keeping a number of balls, knives, dumb-bells, or other articles in the air, catching and tossing them in smooth rotation. This is a narrow definition of juggling, however, for in its correct sense the word embraces all feats of conjuring, legerdemain, and prestidigitation, or sleight-of-hand. The word is derived from the old French *jongleur* and the Latin *joculator,* a jester, joker or clown. The latter's repertoire in Roman times included a variety of tricks, some of them feats of juggling in its restricted sense of tossing articles into the air, mentioned above; of conjuring, or of sleight-of-hand.

Conjuring consists of the execution of tricks and illusions, sometimes with the aid of apparatus. Such feats may include optical tricks, which depend chiefly on the use of mirrors. In 1863 John Nevil Maskelyne astonished British audiences by his ability to disappear from a sealed wood cabinet, a feat made possible by the use of mirrors, drawing the eyes of the audience away from the scene of his escape. Conjuring may also include acoustic tricks, fire tricks, and magnetic and mechanical tricks. In modern times Harry Houdini (1874-1926) performed variations of all these feats.

Sleight-of-hand tricks, or legerdemain, sometimes described as the art of deceptive juggling, require the use of boxes and bottles with concealed compartments or false bottoms, and similar properties. A favorite trick is the substitution of coins, eggs, handkerchiefs and watches, and the traditional rabbit coming from a top-hat. The sleight-of-hand performer depends upon his ability to direct the eyes of his audience away from the real scene of manipulation. In this field of juggling, the most modern appliances of electricity, magnetism and optics are used by popular performers. Juggling in its widest sense has always held the uninitiated spellbound. In ancient times this was due to its apparent association with necromancy, and in modern times to its seeming contradiction of physical laws.

JUGOSLAVIA. *See* YUGOSLAVIA.

JUJUBE (*Zizyphus Jujuba*), a smooth, often spiny shrub or small tree of the buckthorn family, widely cultivated in mild climates for its pleasantly flavored, somewhat plumlike fruit. It is thought to be a native of north China where it has been cultivated since remotely ancient times. Pliny states that the jujube was introduced from Syria to Rome during the reign of Augustus Caesar. It is now extensively grown from southern Europe eastward through Asia to Japan. Since its introduction into North Carolina in 1838 the jujube has become sparingly cultivated in the Southern States and also in California.

JUJUTSU, also jiujitsu and jiujutsu, the Japanese art of leading an opponent to use his strength against himself. The system, which in its higher accomplishments is a closely guarded secret in Japan, apparently originated in China, from which it was brought to the Island empire by a Japanese physician named Akiyama. Jujutsu may be described as the skillful application of a knowledge of the points of weakness in the human anatomy. In its simpler manifestations this form of wrestling abounds in tricks to down an opponent by paralyzing pressure on his "funny bone," or elbow nerve, bending his fingers backward, tripping him up in a rush, applying pressure upon the sensitive gland below the ear, or upon the solar plexus, and similar dodges which are forbidden in occidental wrestling and boxing. Although the most proficient jujutsu wrestlers must undergo rigorous physical training, they require little strength.

There are reported to be more than 300 methods of throwing an opponent, and at one time there were

40 schools in Tokio teaching the science. The Japanese police and navy are taught the conventional tricks, and modified jujutsu has been introduced into the curriculum of the United States Naval Academy. But the "higher jujutsu" is taught in Japan only to men of good moral character. This caution is explained by the fact that several of the grips and holds will numb an opponent's brain, fracture or dislocate bones and tendons, or cause other serious injury.

JUKES, a pseudonym for a New York State family whose history for several generations has been minutely studied in a sociological investigation as to the effects of hereditary elements in crime, disease and poverty. R. C. Dugdal incorporated the results of his study in the thirtieth annual report of the Prison Association of New York. Of the 1,200 descendents of an early Dutch backwoods settler, the histories of 709 were traced; 280 members of the family were at some time or other dependent on public support; 140 were criminals, and many were neurotics and of antisocial temper. The estimated social cost of 75 members of this family was over one million dollars. A later study is the *Jukes in 1915* by Arthur H. Estabrook.

JULIAN (c. 331-363), Roman Emperor, usually called the Apostate, the nephew of Constantius the Great. When only a child his entire family, except Gallus, his half-brother, was slain, so that the claims of Constantius's sons to the throne would be indisputable. Julian was kept under strict surveillance until 355, when Constantius, tired of government, made him Caesar and the administrator of Gaul. When Julian defeated the Teutons in Gaul, he became the object of calumny by Constantius's court. This led to an open break between Julian and Constantius, culminating, in 361, in the death of Constantius, whereupon Julian became sole emperor. In his religious policy Julian won the bitter hatred of the Christians. Though tolerant of the new religion by policy, he was pagan in belief, and conceived it his mission to dethrone Christianity from the dominant position it had won during the half-century preceding his reign and to reinstate the pagan pantheon. Hence his apellation "Apostate." In 363 he started from Constantinople with a powerful army on an expedition against Persia. At first successful, he was at last treacherously misled and surrounded by the entire Persian army. On the day of battle he died in his tent of a mortal wound, June 26, 363.

JULIUS, name of three popes. Julius I, 337-352, combatted the Arian heresy and was recognized as arbiter in disputes among other bishops. Julius II, 1503-13, nephew of Sixtus IV, was a great warrior and politician, as well as patron of the arts and sciences. He consolidated the Papal States and strove to free Italy from foreign yoke, thereby combatting the great monarchs of his day with diplomacy and force of arms. He was a hero to Rome and died in the midst of further great plans. Julius III, 1536-55, ameliorated the relations of Charles V with the Holy See and called the Council of Trent to another session.

JULIUS ROSENWALD FUND, a foundation incorporated by JULIUS ROSENWALD in 1917 under the laws of the State of Illinois for the "well-being of mankind." For the first 10 years the fund limited its activities almost exclusively to the Negro rural school program. There had been completed in 1930 over 5000 school buildings having a teacher capacity of over 12,000 and a pupil capacity of 600,000. The trustees of the fund have now turned their attention to the whole subject of Negro education; also to other general fields: pay clinics, general education and child study, social studies and public administration. Rosenwald's gifts have approximated $22,000,000, and the principal as well as the annual income may be spent at the discretion of the trustees of the fund. According to the stipulation of the founder, when the fund was reorganized in 1928, both principal and interest must be expended within 25 years of his death.

JULLUNDER or **JALANDHAR,** a city, district and division in Punjab, British India. The city, on the Delhi-Peshawar main line of the North Western Railway, manufactures silk, gold lace and pails. The triangular district of Jullunder, in the Jullunder Doab, between the rivers Sutlej and Beas, produces wheat and engages extensively in sugar refining and cotton weaving. Area of district, 1,431 sq. mi. Area of division, 18,950 sq. mi. Pop. 1921, city, 71,008; district, 822,544; division, 4,182,000.

JULUS. *See* IULUS.

JULY REVOLUTION, THE, a revolution in Paris in July 1830, by which the last of the direct line of Bourbon kings was driven from the throne of France. Following a narrow minded reactionary policy in favor of the Clericals and Ultra-royalists, Charles X incurred the opposition of all Liberals and Republicans. After the elections in 1830, that returned an increased liberal majority, the King issued the July Ordinances. These declared the recent elections illegal, suspended the liberty of the press and changed the suffrage law. This violation of the charter led to an immediate revolt, in which for the first time barricades were used freely in street fighting; they were defended by revolutionists singing the *Marseillaise.* The army was called out but fought half-heartedly as the soldiers sympathized with the revolution. When Charles X realized what had happened, he fled to England. A difference arose between the working men, who wanted a republic and the wealthy bourgeois, who favored a Constitutional monarchy; but the latter soon gained control of the situation and found a King in Louis Philippe, who was proclaimed "King of the French" by the "Grace of God and the will of the nation," with the tricolor as the national flag in place of the White Flag of the Bourbons.

JUMPING-BEAN, MEXICAN, the name given to the hard beanlike seeds of certain Mexican plants, some of which exhibit quick jumping movements. The best known are produced by the "palo de la flecha" (*Sebastiania pavoniana*) and the "hierba mala" (*Sapium biloculare*), two poisonous shrubs of the spurge

family, the milky juice of which was formerly used for arrow poison. The curious leaping movements of the seeds are produced by the whitish larva of a small tortricid moth (*Carpocapsa saltitans*) closely related to the CODLING MOTH or appleworm. The larva consumes the contents of the seed, covers the inner surface with a web, finally changes into a chrysalis, and later emerges as a moth.

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JUNCTION CITY, a city in east central Kansas, the county seat of Geary Co., situated at the confluence of the Republican and Smoky Hill rivers, where the Kansas River is formed, 65 mi. west of Topeka. Bus lines and two railroads afford transportation. Junction City, a division point, is a market and shipping center for the agricultural products. Aside from farming the city has foundry and railroad shop interests. Near by is Ft. Riley, a 20,000-acre military reservation maintaining the Army Cavalry School, a National Guard Camp and an aviation field. Ancient Indian mounds and Ogden Monument, marking the center of the United States, are in the vicinity. Junction City was incorporated in 1859. Pop. 1920, 7,533; 1930, 7,407.

JUNEAU, the territorial capital city of Alaska, in the first judicial division, situated on the Gastineau Channel, on the southeastern coast; served by several steamship lines. The city is on the Glacier highway and has a hydroplane port. The affairs of government and of the first district court of Alaska are transacted here. Fish, lumber, pulp and paper industries are rapidly replacing gold-mining as commercial interests. The Alaska Juneau mine is in the vicinity. The climate is comparatively temperate; the surrounding country is ruggedly beautiful. Pop. 1920, 3,058; 1930, 4,043.

JUNE BUG (*Lachnosterna fusca*), a beetle of the family *Scarabæidæ*, of the order Coleoptera. The adult beetle has a dark brown body and is large and clumsy. It emerges after dark, eating the foliage on trees, particularly in May and June. The eggs are laid near the surface of the ground, and in from two to three weeks they hatch into white, brown-headed grubs which feed on the roots of plants. The larvæ spend several years in the soil, digging down deep in the winter, and coming up in the spring.

JUNGLE, dense, almost impenetrable tropical vegetation, largely second growth. African junglelands are overgrown with giant grasses. The Australian jungle has dense, rich scrub and entangling vines of the "bush." Bamboos, canes, and other palms choke the steaming, swampy jungles of India. These are typified by the malarious *tardi* at the foot of the Himalayas, and in Sundarbans, at the mouth of the Ganges. Here tigers, elephants, monkeys and gigantic snakes abound.

JUNIATA COLLEGE, at Huntingdon, Pa., a coeducational institution conducted under the auspices of the Church of the Brethren. Founded as The Brethren's Normal School and Collegiate Institute in 1876, it became Juniata College 20 years later. In 1931 the productive funds were $742,522. The library contained 45,000 volumes. In 1931-32 there were 500 students, and a faculty of 43, headed by Pres. Martin Grove Brumbaugh.

JUNIOR COLLEGES, as ordinarily organized, are independent two-year units in the educational system to which pupils are admitted upon graduation from high school. The opening of junior colleges is a part of a radical reorganization of the whole educational system, which aims to extend the present four-year secondary course two years at the lower level (*see* JUNIOR HIGH SCHOOLS) and two years at the top level. It is held that with this reorganization all the work belonging to secondary education will be brought together in a single institution and will thus eliminate wasteful duplication. The work in the average junior college is equivalent to that done in the first two years of liberal arts colleges. There are three groups of junior colleges: private institutions which far outnumber the others, public junior colleges usually controlled by local school authorities, and those affiliated with state teachers colleges and universities. Legislative acts have been passed in 18 states authorizing junior colleges, and others are now working toward similar legislation. In 1930 there were 429 junior colleges, 50 of these being in California, and only 150 east of the Mississippi.

See L. V. Koos, *Junior College Movement,* 1925.

JUNIOR HIGH SCHOOL, an intermediate school designed to bridge the gap between elementary and secondary schools, formed by reorganizing the 7th and 8th or 7th, 8th and 9th grades of the grammar school, to include instruction in subjects heretofore given in high schools. The adoption of junior high schools is a part of a radical reorganization of the whole educational system. (*See also* JUNIOR COLLEGE.) While still in the experimental stage in standardizing its courses and methods of teaching, the junior high school has been definitely accepted. The movement, started about 1905, has made steady progress except for the years of the World War. By 1923 fully three-fourths of school systems in cities of 100,000 and over had adopted plans for junior high school reorganization. It is held that the junior high school will overcome the present high student mortality by offering vocational studies to many who would otherwise give up their school work as early as allowed by law, will recognize and arrange for individual differences in students, and will provide better teaching through departmentalization of school work.

See L. V. Koos, *Junior High School,* 1927.

JUNIPER, the general name for a large genus (*Juniperus*) of pungent aromatic evergreen trees and shrubs of the pine family, closely allied to the cypress. There are about 40 species very widely distributed in the Northern Hemisphere outside the tropics. Fully half of these, together with numerous varieties, are cultivated for their ornamental form and foliage. Various species yield valuable woods, oils and other useful products. In size and habit junipers range from

tall slender trees to bushy and sometimes creeping shrubs. They bear small needle-like or scale-like leaves, minute flowers and a globular cone fruit (strobile), which at maturity becomes fleshy and berry-like.

The common or dwarf juniper (*J. communis*), usually a low shrub but sometimes a small tree, is the most widely distributed of all conifers, ranging in various forms from the arctic circle southward over most of Europe, Asia and North America. Its resinous aromatic fruit is extensively used in northern Europe to flavor gin.

In the United States some 15 species are found, 12 attaining the size of trees; of these seven are of economic value for wood or other products. They occur most numerously in the western and southern states. The most important commercially are the eastern red cedar (*J. virginiana*) and the southern red cedar (*J. lucayana*), both of which yield a fragrant red wood extensively used for making lead pencils, chests and closet-linings.

The Old World species most commonly cultivated in America are numerous European varieties of the common juniper (*E. communis*), dwarf forms of the savin (*J. Sabina*) and variants of the Chinese juniper (*J. chinensis*); less frequently grown are the plum juniper (*J. macrocarpa*), the Greek juniper (*J. excelsa*) and the habhel (*J. drupacea*). The tallest juniper is probably *J. procera,* sometimes 150 ft. high, found in East Africa. A. B. J.

JUNIUS, LETTERS OF, a series of political letters, generally abusive, which appeared in the London *Public Advertiser* in 1769-72. They were signed with the pseudonym Junius and aimed at the overthrow of the Conservative ministry. Their chief claim to fame was the question of their authorship, for though they aroused great popular excitement they neither overthrew the ministry nor survived as examples of masterly political discussion. The authorship is now generally attributed to Sir Philip Francis.

JUNKER, the name given to the landed gentry of Prussia and Northern Germany, a conservative class that long exercised great influence upon the military and political life of the country. Since the middle of the 19th century the term Junkertum has been used frequently as the designation of the party of reaction in Prussia. The importance of these aristocratic landowners has been seriously affected, however, by the revolution of 1918 and the dismemberment of Prussia by the TREATY OF VERSAILLES. The name was also applied to the wealthy merchants of Dantzig, where the exchange building is still known as the Junkerhof.

JUNO, in Roman mythology, the queen of heaven, identified with the Greek HERA. She was the daughter of SATURN and RHEA, and wife and sister of JOVE. Her children were ARES, HEBE, HEPHAESTUS and Ilithyia. As queen of heaven her power was equal to her husband's. The HORAE, goddesses of the seasons, and IRIS, goddess of the rainbow, were her handmaidens. As the only legal and faithful wife on Olympus, she was looked upon as the protectress of honorable marriage, and was invoked as Juno Julalis by women entering into marriage. The goddess was also invoked by women on their birthdays as Juno Natalis, and in childbirth as Juno Lucina. As guardian of finance she was called Juno Moneta. Her festival, the Matronalia, was held on Mar. 1. The month of June was named for her. The peacock was Juno's special bird, and her fruit was the pomegranate, symbol of wedded love and fruitfulness. Mythology is full of stories of Juno's machinations as a jealous wife.

JUPITER, or **JOVE,** in Roman mythology, the king of the gods, identified with RHEA. He was the brother and husband of JUNO. His name is derived from Diespiter or Diovispater. The god was called Jupiter Optimus Maximus, Lord of Heaven; other titles being Pluvius, Fulgurator, Tonans and Fulminator, designating his power over the elements. At the games he was Jupiter Capitolinus, and at the *Feriae Latinae* he became Jupiter Latiaris. With his thunderbolt he slew all offenders. Jupiter's power was far reaching, and he foretold the future by signs and omens called *Prodigialis.* At Rome the god's temple stood on the top of the Capitoline Hill, and his priest was the Flamen Dialis, the chief of the flamens. The consuls invoked him on taking office and on all important occasions. Jupiter is represented as sitting on a throne holding a scepter of cypress in one hand and a thunderbolt in the other.

JUPITER, the largest planet of the solar system, and the fifth in order of distance from the sun. It revolves around the sun in nearly 12 years, at an average distance of 482 million miles, in a slightly elliptical orbit that makes an angle of only a little more than one degree with the plane of the ecliptic. Its distance from the earth may vary from 367 million to nearly 600 million miles; when at its nearest it easily outshines Sirius, the brightest star in the sky. Jupiter has a diameter nearly 11 times that of the earth, a volume and mass 1,312 and 313 times, respectively. Its density is four times smaller, and only 1.6 times greater than that of water. Owing to the rapid axial rotation (9 h, 55 m) of this giant planet, Jupiter is very much flattened at the poles, a fact easily visible in even a small telescope. Its equatorial diameter is more than 88,000 miles, the polar one less than 83,000. The planet's surface is covered by dense clouds arranged in belts parallel to the equator; the temperature on its surface is probably about 220° below zero.

Jupiter has nine satellites. The four brightest were discovered by Galileo when he turned his first telescope to the sky in 1610. These four revolve around the planet in periods ranging from less than 2 to nearly 17 days, at distances from 262,000 to 1,169,000 miles. Two are about the same size as the moon, two a little larger. During their circling around the giant planet, these satellites pass in its shadow at nearly every revolution and thus suffer eclipses. These eclipses can be timed very accurately. The delays in

the time of their occurrence when Jupiter is far away from the earth, as compared to when it is near, are due to the longer time consumed by the rays of light in traveling the greater distance, and thus provide a basis for determining the velocity of light. A fifth satellite revolves in 12 hours at a distance from Jupiter's surface of only 25,000 miles. The four remaining satellites, all very small, revolve in periods from 8 months to two years, at distances from 7 to 15 million miles. The outer two revolve in direction opposite to that of all the others. W. J. L.

JURA MOUNTAINS, a series of ranges forming the frontier between France and Switzerland and extending in the former country from the department of Ain to Alsace. In Switzerland the Jura chain runs along the cantons of Vaud, Neuchatel and Bern. The total length of this mountain system, which forms a curve from south to northeast between the Rhine and the Rhone, is about 200 mi. The valleys which intercept the ranges are traversed by rapid streams running from north to south. Crête-de-la-Neige, in France, is the culminating point, reaching a height of 5,653 ft. In Switzerland Mont Tendre, 5,521 ft., and the Dole, 5,511 ft., are the highest summits. Limestone formation is the chief geological feature of the Jura Mountains.

JURASSIC PERIOD, the second subdivision of the MESOZOIC ERA of geological history. The rocks of the period were first studied in the Jura Mountains, whence the name.

JURE SANGUINIS. *See* DOUBLE ALLEGIANCE.

JURE SOLI. *See* DOUBLE ALLEGIANCE.

JURISDICTION, authority to decide the subject matter presented to the court or body. The jurisdiction requires the proper locality, the right parties, a bringing of the parties or the property before the court, and the question involved to be within the scope of the authority of the tribunal.

JURISPRUDENCE is perhaps best defined as the philosophy of law. The study of law is the study of how disputes have in fact been decided by courts, and of the official rules laid down by courts or legislatures for the decision of future disputes. The practical side of law includes also the conduct of cases in the effort to produce a favorable decision, and the shaping of the client's conduct by advice in the lawyer's office so that legal dangers are seen and avoided. The more theoretical side of law consists in working out, on the basis of the authoritative materials as they stand, what the presumably right decision on a particular point would be; and in putting the results of such work into coherent, orderly form.

But in jurisprudence all such matters are presupposed. The problem is, taking as given all the work which has just been described, to draw more general conclusions. What are the ways of law as an institution, which outlast specific laws? What is the purpose of law, and how far does any particular system of law conform to that purpose?

One of the most persistent and fruitful lines of thought in jurisprudence has been the quest, as, e.g., by Cicero, the scholastics, Grotius, for *natural law,* i.e., for rules of law which in the nature of things are right. This quest draws vitality from the fact that many institutions and needs have proved well nigh universal (e.g., prohibition of killing; and from the fact that law, an institution essentially conservative in all the senses of that word, easily becomes prey to historical accident, and to carrying forward into a new age features which have since outgrown their usefulness. By comparing various systems of law, the common core which seems "natural" and eternal can be discovered; this offers some guide to criticism of particular phases of law. Whether the natural law thinker be religious, and seek natural law as being divine law, or be skeptical, and search merely for the true nature of man, he works with reason as his guide. Unconsciously, therefore, he carries all his own training and ideals into his work, as the measure of right reason. But his comparative and critical approach have proved tremendously valuable in clearing up and reforming legal system.

It should be noted, however, that the natural law idea may also work to bar change; this occurs whenever the legal system as it has been is identified in the thinker's mind with right nature; indeed, many of the less fortunate decisions of our Supreme Court nullifying new laws as in conflict with the CONSTITUTION are traceable to this last type of natural law thinking. In the present century a more sophisticated and less ambitious line of natural law thinking is appearing, which seeks not specific rules proper for all times, places, and peoples, but the rules which are "natural" to a particular type of civilization—for instance modern Western European CAPITALISM.

Rightness, in conformity to reason, is the essential element of law to the natural lawyer. Another fruitful line of approach, that of the historical school (Savigny, J. C. Carter) also emphasized rightness, but rightness in conformity to custom. Their great contribution lay in driving home the extent to which working law depends on the habits and ideas of the people; in emphasizing both the slow change of law as custom changes, and the huge inertia which stands in the path of changing men's ways by mere legislating. Their chief faults were two. Turning to history for light on the nature and slowness of law's changes, they lost sight of the present. And while stressing the importance of custom and inertia, they failed to recognize that customs are not uniform in our complex society, and so failed to discover one great technique of legal change: the capitalizing of the desirable customs of one portion of society, as a tool in rooting out the variant undesirable customs of some other portion. Both troubles seem partly due to a hangover into their thinking of the quest of one single system of naturally right law at least, for a particular people. They altered not the goal sought, but merely the means of discovering it.

Analytical jurisprudence (Austin Holland, Gray) which in contrast to the general European natural law

thinking and the German historical school flourished especially in England, and so strongly affected us (*see* COMMON LAW), is essentially a lawyer's rather than a philosopher's jurisprudence.

It takes the existing legal system not as a something to be criticized, but as a something to be studied and made orderly and whole. It differs from the ordinary work of law only in the larger scope of its generalizations. Instead of asking e.g., what is needed to make a valid contract, it asks, how contract rights differ from property rights, how many kinds of rights there are, and how the different kinds are related to each other, and the like. Its results, when soundly reached, are rather directly available for practice, because they are built directly out of practice. Its fault is that it is sterile on the very point of most interest to a healthy jurisprudence; to wit: is there value in these rules? Do they work?

These are the questions which chiefly occupy the so-called sociological jurisprudence which, beginning almost simultaneously in Germany (Ihering), France (Geny) and (independently) in the United States (Holmes; later Pound, Cardozo) in the '70s, now dominates the scene. To the sociological jurist law is a means to an end, is to be modified and readjusted whenever it fails to achieve its end, and is to be constantly reexamined in its effects on society. He takes over from the analytical jurist a keen interest in what the law now is, as a foundation for his work; from the historical jurist, a recognition of the importance of how people are now acting, and a recognition of what can be done. (*See* LAW, ADMINISTRATION OF.) He takes over from the natural lawyer the desire for constant improvement, and a willingness to rely upon reason. But his title "sociological" comes from his effort to use proved facts about society as the foundation of any changes in the law. In the past decade in this country there has branched off from the sociological school a strong group (Bingham, W. W. Cook, C. E. Clark), which aims to set beside the philosophy of law a social science akin to economics, taking as the foundation not so much the rules of law as the actions of judges and the effects of such actions on others. This last movement (realism) seems the logical next step toward bringing the ideals of sociological jurisprudence into effective practical form. K. N. L.

JURY, a group of citizens called in to aid a court of law in finding facts. The GRAND JURY is a body of men at Common law not less than twelve nor more than twenty-three returned at stated periods from the citizens of the county, before a court of competent jurisdiction, and charged primarily to inquire in regard to crimes committed within its jurisdiction. Although it is an informing and accusing, not a judicial, body, it has nevertheless been frequently regarded as a means of protecting persons against unfounded accusations.

The petit jury is a body of men—twelve, except as in some special instances of minor offenses and small claims otherwise provided by statute—selected by lot from a panel drawn from the citizenry at regular intervals for the purpose of trying the facts in issue in a judicial trial. The right to trial by jury was incorporated as an express guarantee in the constitutions of the United States and of the separate states. Qualifications and exemption of jurors are for legislative control, but discrimination on account of color or race, and in some states, sex, is unconstitutional. Suits in equity and probate proceedings, triable at COMMON LAW without a jury, remain outside constitutional guarantees of jury trial. Jurors may be challenged by the parties either for cause—bias, personal interest, opinion, etc., or peremptorily, i.e. regardless of cause. Within the number allowed by law, the right to such peremptory challenges cannot be denied by the court. Challenge may also go to the entire panel. Constitutional right to jury trial, being a privilege intended for the parties litigant, may be waived by them. N. G.

JUSSERAND, JEAN ADRIEN ANTOINE JULES (1855-1932), French diplomat and author, was born at Lyons, Feb. 18, 1855. Educated at Lyons and Paris, he entered diplomacy, served in London and Tunis, and in 1890 was appointed minister to Denmark. He held this post until 1902, when he became French ambassador to the United States, a position which he filled with distinction until his retirement in 1925. He was a keen student of English literature, in which he did interesting original research, publishing several books of historic and literary merit and a 3 vol. *Histoire Litteraire du Peuple Anglais* (1895-1909). Jusserand died at Paris, July 18, 1932.

JUSSIEU, ANTOINE LAURENT DE (1748-1836), French botanist, was born in Lyons, April 12, 1748. In 1770 he became professor of botany at Paris and in 1777 director of the newly founded Jardin des Plantes. He investigated and classified plants and was practically the founder of the modern system of botanical classification with his *Genera plantarum secundum ordines naturales disposita,* 1789. A final and penetrating analysis of plant life appeared in his *Principes de, la methode naturelle des vegetaux,* 1824. He died at Paris Sept. 17, 1836. Jussieu was a member of a most distinguished family of French botanists, including, Antoine Jussieu, 1686-1758, Joseph, 1704-19, Laurent Pierre, 1792-1866, Adrien Laurent, his son, 1797-1853.

JUSTICE, DEPARTMENT OF, a government department under the headship of the Attorney General, the chief legal officer of the United States, its representative in legal matters generally and adviser on request to the President and department heads. Cases of exceptional importance in the Supreme Court require the presence of the Attorney-General. Under his direction are the Federal district attorneys and marshals of all the judicial districts of the United States. The Attorney-General is also obliged to furnish special counsel for the United States in cases of particular importance. His chief assistant is the Solicitor General. No appeal is taken by the United States to any appellate court without his authorization. Eight

additional assistant attorneys-general and a number of solicitors and bureau heads complete the higher personnel of the Department of Justice. The Bureau of Investigation conducts inquiries into alleged offenses of most kinds against the United States. The Bureau of Prohibition transferred in 1930 to the Department of Justice from the Treasury Department is headed by a Commissioner of Prohibition, who controls the enforcement and investigates violations of the National PROHIBITION Act. Other attorneys are in charge of pardons and of prisons. There is a special solicitor for the Treasury, Commerce, Labor and State departments. S. C. W.

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JUSTICE OF THE PEACE. In origin, justices of the peace were English administrative officials appointed to keep the peace. Successive statutes added to their duties until, at the end of the sixteenth century, they had become magistrates with a petty criminal jurisdiction, a jurisdiction to bind over offenders to the Grand Jury, and a number of important administrative duties. In the United States they usually have both civil and criminal jurisdiction covering small debts, petty offences, and preliminary examination of those charged with graver crimes. In the larger cities of the United States, they are coming to be replaced by municipal courts, and some states have replaced them by better organized inferior tribunals. In a few states they are appointed for life or good behavior, but usually are elective for relatively short terms.

JUSTINIAN I (483-565), called Justinian the Great, Emperor of the Eastern Roman Empire, was born at Tauresium in Illyricum May 11, 483, of Slavonic descent. His uncle, Justin I, was East Roman Emperor from 518-527, and made his nephew chief administrator and joint Emperor. Justinian became sole Emperor one year after the death of Theodoric the Ostrogoth, and seized the chance of attempting to consolidate the empire by conquering the German kingdoms of the West. Through the able generalship of Belisarius and Narses, successive commanders of his armies, Justinian conquered the Vandals in Africa and the Ostrogothic kingdom in Italy and Sicily, 535-540. The Spanish kingdom of the Visigoths, however, resisted permanent penetration. In thus scattering his energies Justinian weakened the position of the empire in the East, where conflict with Persia was endemic.

Justinian's claim to greatness does not rest upon military exploits. The practical necessity of raising money to carry on his military campaigns and his vast plans for public improvements in the shape of important public works and church edifices turned his attention to the administrative technique of legislation and finance. In the field of administration his most enduring monument is the reduction of the chaos of Roman law to at least a semblance of order. Justinian placed the eminent jurist, Tribonian, at the head of a legal commission that drew up first the *Code,* consisting of 12 Books of Statutes, and then the *Digest,* containing 50 Books summarizing the judicial decisions of the Civil Law. These two works constitute a most important contribution to modern civilization. Of a different sort, but equally priceless, is the artistic contribution of his reign, the most signal example of which is the church of St. Sophia at Constantinople. The efforts of Justinian to stimulate agriculture, industry and commerce were rendered nugatory by the heavy expenditures to which he subjected the state. He was not what may be termed a great man, but he was able to secure the service of loyal lieutenants, and he possessed great patience in the attention to the details of administration. He made enemies, as evidenced by the Nika riots in the Hippodrome. He had a passion for theological subtlety, entering himself in the disputes of rival schools, and his attempts to stamp out religious opposition aroused much bitterness. In his work he was ably seconded by his wife Theodora, who was possessed of quicker intelligence and greater decision of character than her husband. Justinian died Nov. 14, 565.

JUST INTONATION, a system of tuning based upon acoustical principles rather than upon mechanical convenience. The tempered or modified scale now in almost universal use is a modification of just intonation or pure tuning. *See also* INTERVAL; PITCH; TEMPERAMENT.

JUTE, a very valuable plant fiber used for cordage and in making coarse cloth. The fiber is obtained chiefly from two plants of the linden family (*Corchorus capsularis* and *C. olitorius*), natives of India, where they have been cultivated since ancient times, and now naturalized in other tropical countries. They are tall annual herbs with straight stems branching only at the top, oblong deeply toothed leaves and small yellow flowers. Jute, like flax and hemp, is prepared by wetting the stems under water and beating out the fiber, which is allowed to dry in the sun. It is manufactured into a coarse twine and into gunny cloth, extensively used for sacking and for burlap. Although jute has been grown in various tropical countries and produced experimentally in Florida, its commercial cultivation is practically limited to India, where the annual yield of fiber is enormous, amounting to upward of four billion pounds a year.

Jute Manufacture. The ultimate fibers of jute are only from one-eighth to one-half inch in length and it is difficult therefore to spin them into very fine yarns. Jute is a cruder fiber than either flax or hemp and is prepared upon similar but coarser machinery. A preliminary stage is the softening of the material by passing it through a series of heavy rollers and by lubricating it with batching oil so that it may be worked more easily in the CARDING and DRAWING processes. It is necessary to separate the fibers as much as possible and to lay them parallel by a COMBING action; and, finally, to gather together an appropriate quantity of the parallelized fiber and to twist (*see* TWISTING) it into a yarn.

Jutecloth, which is largely used in the carrying trade of the world, is woven upon looms of the cone-over-pick type. Plain fabrics, such as hessian or burlap, are produced when the warp and weft threads pass over and under each other alternately. As the finish depends largely upon the amount of moisture in the cloth, which becomes heated under pressure, the fabric is first damped, then calendered, and finally mangled.

Burlap, bagging, sacking, backing for linoleum, dyed CARPETS and mats, twines, curtains and decorative fabrics are among the most important jute products. Gunnies, which are used for baling cotton, are the coarsest jute goods produced. Calcutta and Dundee are the chief seats of the jute industry, the finest yarns and fabrics being manufactured in the latter city. C. R. C.

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JUTLAND, the continental part of DENMARK, is an extension of northern Europe, and has a total area of about 11,000 sq. mi. Most of the surface is low and flat, the greatest elevation being about 500 ft. above sea level. The coast line of Jutland is much indented and there are a number of good harbors. Many small lakes are scattered through the region, which derives its name from the Jutes who once inhabited it. Pop. 1930, 1,623,362.

JUTLAND, BATTLE OF, the only major naval engagement of the WORLD WAR. On the afternoon of May 31, 1916, British Vice-Admiral Sir David Beatty, commanding a squadron of battle cruisers, sighted the scouting forces of the German Vice-Admiral Hipper, in the North Sea, approximately 75 miles northwest of the Danish peninsula of Jutland. Both Admiral SIR JOHN R. JELLICOE, commanding the British Grand Fleet, and Admiral Reinhard Scheer, commanding the German High Seas Fleet, began maneuvering for a decisive action, although neither naval commander expected to meet the respective enemy fleet in full force. Ultimately the British brought into action 28 battleships and 9 battle cruisers; the Germans employed 22 battleships and 5 battle cruisers, or 10 less capital ships, which gave Jellicoe a superiority of 100 turret guns. In addition to these capital ships, the British employed eight armored cruisers, 26 light cruisers, and 80 flotilla leaders and destroyers, as compared to the Germans 11 light cruisers, and 63 flotilla leaders and destroyers. Without dealing with technical aspects of the respective forces, the foregoing figures reveal that the British enjoyed a superiority of 50 ships of all classes.

On sighting the German scouting ships, Beatty steamed east and opened fire. Outlined against the setting sun, the British were at an initial disadvantage, and their marksmanship was inaccurate. The battle cruisers *Lion, Indefatigable* and *Queen Mary* were sunk, and the cruisers *Nestor* and *Nomad* disabled, before the British accounted for two German light cruisers. About 5 p.m. the full German battle fleet was sighted, and Beatty, turning north, attempted to draw it after his cruisers, so that Scheer would be forced to meet Jellicoe, approaching with the British Grand Fleet. At 5:40 p.m. Jellicoe sighted the German main body and opened fire at 14,000 yards. While Jellicoe engaged Scheer, Beatty hoped to bear down with the cruisers from his position north of the battle area. The German light cruisers *Wiesbaden, Pillau* and *Frankfort* were quickly disabled; but the Germans responded by sinking the *Shark*. At this point, Scheer decided to withdraw under the cover of night, and Jellicoe ordered a deployment eastward to encircle the German fleet. Before complete darkness fell, a squadron of Hipper's battle cruisers sunk the British cruisers *Warrior* and *Defence;* but Scheer's navigable area was becoming increasingly restricted. Nevertheless, the British cruiser *Invincible* was sunk by the battleship *König,* whereupon Scheer undertook a masterly "emergency retirement." Four German cruisers were severely punished before Scheer's battle fleet retreated westward, and eventually escaped Jellicoe by way of the Horn Reefs, to the southeast. During the sporadic night fighting, however, the Germans lost the battleship *Pommern.* An ideal battle for technical discussion, Jutland was by no means a decisive encounter. The Germans lost 1 battleship, 1 battle cruiser, 4 light cruisers and 5 torpedo craft, a total of 11 ships. The British lost 3 battle cruisers, 3 cruisers and 8 torpedo craft, a total of 14 ships. The German loss of life was 2,545 officers and men, compared to British losses of 6,097 officers and men.

JUVENAL (Decimus Junius Juvenalis) (c. 60 A.D.-c. 140), Roman satirist, is thought to have been born at Aquinum, about 60 A.D. Ancient biographers relate that he was the son or foster son of a rich freedman, that he spent the first half of his life engaged in declamatory exercises and that he began writing satires in middle age. According to tradition, at the age of 80 he was banished to Egypt under the pretence of receiving a military post there, because he had attacked in his satires an imperial favorite, Paris. Soon afterward, we are told, he died there of chagrin and boredom.

Juvenal has left us 16 satires, which are commonly divided into five books. His poetry is replete with sincere and passionate protest against the degradation of Roman society. He himself tells us, in *Satire* I:79, *facit indignatio versum:* "indignation prompts my verse." Both HORACE and he chose similar themes, but the satire of Horace is light-hearted and indulgent, whereas Juvenal's burns with moral indignation. His language is forcible and often moving; the rhetorical coloring reflects his earlier training. The influence of Juvenal on later satire was considerable. (*See also* SATIRE.) Perhaps the most interesting of his satires are: I, in which he gives his reasons for writing satire; III, a vivid portrayal of the ugliness and discomforts of life in the metropolis; V, describing the insulting treatment of a client at a rich man's table; VI, a warning against marriage ("Why marry," the poet says, "when suicide is so easy!"); and X, which preaches the folly of vain ambition. Satires

III and X have been paraphrased by DR. SAMUEL JOHNSON, in his *London* and *The Vanity of Human Wishes*, respectively.

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JUVENILE COURTS. *See* CHILDREN'S COURTS.

JUVENILE DELINQUENCY, a legal concept including acts or conditions of children defined as such by juvenile court laws of a given jurisdiction. Any act which in persons above juvenile court age would constitute CRIME or MISDEMEANOR, is, if done by juveniles, not crime but evidence of delinquency, a condition rendering the child subject to judicial guardianship. Juvenile delinquency frequently includes, however, other acts or conditions, not considered offenses in adults, e.g., being out at night or smoking habitually. Whether it also includes similar offenses not yet apprehended or judicially recognized, varies with usage. It is estimated that 200,000 cases are annually dealt with by United States courts. Uncontrolled variables in the situation make the full extent of delinquency uncertain. Separate children's sessions of criminal courts were found in Australia in 1889, in Canada in 1894 and in several states of the United States, but the first typical juvenile court law went into effect in Illinois in 1899, defining juvenile delinquency, giving jurisdiction to a special branch of an equity court, operating under chancery powers and procedure, and providing for detention home and probation under court administration as alternates to existing dispositions. Such laws were rapidly passed in most countries; some still adapt the criminal code to a similar procedure and treatment. The same courts are usually given jurisdiction over neglect cases, and, less often, over certain aspects of dependency, contributory delinquency, domestic relations, mothers' pensions, child labor, feeble-mindedness and foster home placements.

Delinquents are brought to court by individuals, social agencies or police, are released to parents on their own recognizance if possible, or kept in a detention home until the hearing. In the interval a case study is made by probation officer or specialists, and, if the case cannot be dealt with informally, a summary and recommendation is prepared for the judge. In some courts a woman referee is assigned to hear girls. Court process is quiet and informal and often occurs in judges' chambers. If not dismissed, the child may be held for study or warning, put on probation or committed to public reformatory institutions, of which parental schools, houses of refuge and industrial schools are typical, or, in a few states, to religious custodial schools. Reform schools preceded the organization of juvenile courts. Conditions in many are not conducive to reform; few have been leaders in modern criminological, psychological and educational methods. Certain states have institutes of juvenile research in which scientific diagnosis and research are done for guidance of treatment.

Progressive methods of reformation and prevention include also child guidance; mental and physical clinics; visiting teachers, special education and recreational guidance—all as coordinated parts of the educational and welfare system of the community, and throughout the process an objective yet sympathetic attitude of treatment and cure rather than of punishment. As much as possible should be done by persuasion, without court action. Beyond case work, prevention calls for community action in removing or offsetting the social causes of delinquency, including poverty and family breakdown; inadequate and demoralizing housing, recreational facilities or vocational opportunities; gang life, poor schooling, child labor; and neglect of physical and mental defects or disease.

T. D. E.

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KAAKE, a North American Indian tribe speaking the Comox dialect of the Salishan linguistic stock. Their territory was formerly the southeastern coast of Valdez Island, Brit. Col. The tribe is now extinct.

KA'BA or **CAABA,** "cube," the cubical, stone structure in the center of the mosque enclosure in Mecca, toward which Moslems at prayer anywhere in the world turn their faces. At the left of the eastern door there is embedded in the wall the famous black stone (*hajaru 'l-aswad*), a meteorite at first held sacred by the pre-Islamic Arabs, and since Mohammed's day devoutly regarded by all Moslems. The Ka'ba is known also as the House of Allah, and the mosque as a whole is known as the Holy Mosque. The circumambulation of the Ka'ba is one of the important rites connected with the Pilgrimage (*see* HAJJ), including the kissing of the stone.

KABBALAH (Qabbalah or Cabala) from the Hebrew *Kabal,* to receive, is the name given to the religious philosophy of the Hebrews. It is a doctrine taught only to those found "worthy and well qualified." Its origin is much disputed, the most plausible theory being that it developed gradually during centuries, long before the beginning of the Christian Era. But, whatever its origin, there is no doubt that it exerted a most tremendous influence upon the religious, spiritual and social life of the Jew as well as upon a great many Christian scholars.

The Hebrew religion being essentially a religion of revelation, its philosophy naturally follows this course and starts with the proposition (*Zohar,* vol. I, fol. 2a): "When the Unknown of the Unknown wanted to reveal Himself, He first produced one point." From this start, which has been interpreted by the later Kabbalists as the absolute concentration of God within Himself (Tsimtsum); or, from this Infinite (En Sof), the 10 Sefiroth (enumerations, spheres) developed. These are: crown, wisdom, intelligence, mercy, judgment, beauty, triumph, glory, foundation and kingdom. These 10 Sefiroth are present and interrelated in the four worlds: the world of emanation, the world of creation, the world of formation and the world of action. The development of this doctrine, under the cloak of a commentary on the Pentateuch, fills the main work of the Kabbalah, the Book of Splendor (Sefer ha-Zohar), of unknown authorship; although claimed by some to have been the work of an obscure scholar, MOSES DE LEON. The other book, less known, although of greater antiquity, is the Book of Formation (Sefer Yetzirah) which deals mostly with the esoteric interpretation of the Hebrew alphabet and with the numerical value of letters.

While there is great resemblance in the Kabbalah to some ancient and modern systems of philosophy, its charm will be found mainly in its mystical interpretations, its poetical swing and in its moral and ethical teachings. I. S.

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KABUL, capital of Afghanistan and of the province of Kabul, situated on the banks of Kabul River, at an elevation of 7,280 ft. above the sea. There are no notable buildings, the Bale-Hissar, a citadel which formerly dominated the site, having been demolished. It is the converging point of several great caravan roads. During the last century considerable improvement has been made in buildings and streets. The city has water, electricity and other modern conveniences; firearms are the chief manufacture. The region produces fruit in quantity, and there is considerable trade in silk, cotton and carpets.

In the 14th century Kabul fell into the hands of Tamerlane, and in the 18th it was captured by Nadir Shah and made the capital city of the Moguls. In 1839 it was captured by the British. Several years later it was partly destroyed by the British Army. *See* AFGHÁNISTÁN; *History.* Est. pop. 1931, 100,000.

KABUL, the largest river of Afghanistan, rising about 50 mi. above the city of Kabul and joining the Hindus River at Attock, 320 mi. from its source. Kabul, the capital of Afghanistan, and the city of Jalalabad are situated on its banks. Its main tributaries are the Logar, the Panjishir, the Tagao and the Kunar. The Kabul is navigable only by small craft from its mouth to Jalalabad.

KADDISH, ancient Hebrew prayer for the dead, recited at the grave in burials, three times daily during the 11 months of mourning after the death of a parent, and on every yearly recurrence, *Yahrzeit,* of the day of a parent's death. The Kaddish (mourners' or orphans' Kaddish) was composed for the most part in Aramaic; but the last sentence and part of the next to the last sentence are in Hebrew.

The Kaddish contains no mention of the dead, nor any prayer for the repose of their souls, but is merely a doxology, or praise of God, as follows: "Extolled and sanctified be the great name of God, in the world which He created according to His will. May He cause His reign to become manifest within your lifetime and within the lifetime of all the house of Israel, very soon. May the name of the Holy One be praised and glorified and exalted, for He is above all praise and blessing and song which human beings may utter. May great peace and life descend from Heaven upon us and all Israel. May He who brings about peace in Heaven cause peace to come upon us

and upon all Israel. Amen." Among Orthodox and Conservative Jews only male mourners are required to recite the Kaddish; among Reform Jews, however, it has become the custom for women also to recite this doxology.

Originally the Kaddish prayer was used as a concluding benediction at the end of the divine service or at the end of important parts of the divine service (full Kaddish or half Kaddish); it is so used by Orthodox and Conservative Jews to-day. Originally it was not used at all as a prayer for the dead; it was only in later times, after a long and gradual evolution, that it attained its modern significance as a commitment and memorial prayer. For originally the Kaddish was a hymn containing the basic idea of the Messianic kingdom here on earth; its chief motif is reminiscent of the doxology in Daniel 2:20. As such it was first mentioned about 150.

At about the end of the 6th century the Kaddish came to be associated with the liturgy, also with the rabbis at the academies; in this form, the Kaddish Derabbanan (Kaddish of the rabbis), it was a prayer for the health of the learned rabbis, and was recited by mourners at the end of lectures on the Talmud in the schoolhouses. Its recital by sons for 11 months after the death of parents and on the anniversary of death is mentioned for the first time in the 15th century, and was made a general custom through its inclusion in the famous law code, the *Shulhan Aruch*, by Joseph Caro; it was not a part of the original rabbinical law, or HALACHA of earlier days. It seems to have developed on the ground of the legend that Rabbi Akiba once taught a boy how to recite the Kaddish in the synagogue and thus procured peace for the restless soul of the boy's father. In Reform Jewish temples to-day all uses of the Kaddish except that as mourners' or orphans' Kaddish have entirely disappeared. A. SH.

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KAFIR, a stout annual of the grass family cultivated for forage and seed. In growth it resembles true corn (maize), but bears its grain in an erect, cylindrical head at the top instead of in ears at lower joints of the stalk. It has been derived from the same botanical species (*Andropogon sorghum* or *Holcus Sorghum*) as DURRA, BROOM CORN and the sweeter juiced syrup sorghums. (*See also* GRASSES; SORGHUM.) In America varieties of durra have been popularly grouped with kafir, but these are distinguished by their goose-necked or mostly pendant, compact, oval heads. They include three varieties, yellow milo (or simply milo), brown durra and white durra, the last called also Jerusalem, Egyptian or rice corn. The loose application of the terms corn, maize and milo to kafirs and durras has led to confusion, and the erroneous reporting of these crops in the U.S. census. To prevent this the terms kafir and durra are now exclusively used.

KAFIR CORN PRODUCTION, U.S.

7-Year Average, 1924-30

Division	*Acreage*	*Production (Bu.)*	*% of Tot. Prod.*
UNITED STATES	6,392,000	118,335,000	100.0
LEADING STATES:			
Texas	2,747,000	56,019,000	47.3
Oklahoma	1,635,000	26,324,000	22.2
Kansas	1,307,000	23,345,000	19.7
California	108,000	3,426,000	2.9
New Mexico	193,000	3,363,000	2.8

Kafir is native to the southeastern coast of Africa, whence specimens were sent to the Centennial Exposition at Philadelphia in 1876. The Georgia State Department of Agriculture, which procured one of these, grew, selected and distributed the seed. Some of this the U.S. Department of Agriculture secured for wider distribution. Kafir is drouth-resistant and is now widely grown, mainly for forage, in the dry and semi-arid regions of the Southwest. It has the ability to remain dormant during drouth and to resume activity when rains arrive. Kafir is grown like broom corn. M. G. K.

KAFIR, a name applied to Swazis, Zulus, Pontos, Pondomisis, Tembus, Xosas, and in its broadest sense to all Bantu peoples of South Africa. It was probably first used by Arabs of East Africa to designate all pagan African natives and was subsequently adopted by Europeans. Physically the Kafirs are one of the most powerful Negro stocks, and their great energy has placed them among the foremost conquering and state constructing people of Africa. The color range is from black to a yellow brown. Their hair is of the typically woolly negroid variety, their noses broad and flat, cheek bones prominent and lips thick and fleshy. Food is obtained equally from herds and from the practice of agriculture, sour milk and bruised maize or Kafir corn being the staple dishes. Meat is eaten, either boiled or roasted, in large quantities. In common with all Africans, the Kafirs are fond of adorning themselves with ornaments made of beads, shells, bones, feathers and metals. Ear plugs are frequently seen. Certain tribes excel in wood carving, pottery making and weaving. Tribes are generally patriarchial, the chief acting as the father and sympathetic guide of his people as well as their ruler.

KAFIR BREAD, a name given to the spongy, starchy pith found in the ripe cones of the so-called Hottentot breadfruit (*Encephalartos caffer*), a South African palmlike cycad. The plant is known also as the bread palm because the natives make meal from the farinaceous seeds. The stout trunk, which rises about 8 ft. high, bears a dense crown of narrow, rigid leaves and a huge conelike fruit, sometimes weighing 50 lbs., containing numerous large seeds. *See also* CYCADS.

KAGAWA, TOYOHIKO (1889-), Japanese social reformer and labor leader, born in Kagawaken. He studied at Princeton, 1914-17. On his return to Japan, in order to carry out his Christian faith,

he lived in the slums of Kobe and gave his large earnings from his writings to help his neighbors. He soon became a leader in the labor union movement. In 1924-25 he lectured in the United States, Britain, Germany and India. Because of his abilities and his complete devotion to his principles, Kagawa has been one of the principal moral forces in Japan.

KAGU, a remarkable bird (*Rhinochetus jubatus*) somewhat allied to the cranes and the rails, found only in New Caledonia. It is somewhat larger than a domestic fowl, with a large head, strong neck, bright red legs and bill, slaty-gray plumage and a long whitish erectile crest. The wings, which are spread during a curious dance, are conspicuously marked with white, rusty brown and black. It utters a rattling guttural note, feeds largely at night on snails, worms and insects, and lays reddish-buff eggs.

KAHN, JULIUS (1861-1924), American legislator, born in Kuppenheim, Germany, on Feb. 28, 1861. He emigrated to California in 1866. He was an actor for ten years before he studied law and established a practice in San Francisco in 1894. In 1899 he became a Republican member of Congress, where he served consecutive terms, except for 1903-05, until his death. During the World War he served on the House Committee on Military Affairs, and cooperated with the Wilson administration in securing the passage of the Selective Service Act of 1917. He died in San Francisco on Dec. 18, 1924.

KAHN, OTTO HERMAN (1867-), American banker and patron of music, was born in Mannheim, Germany, Feb. 21, 1867. After receiving a college education and banking training at home he was with the London branch of the Deutsche Bank for five years and in 1893 came to the United States. In 1897 he formed an association with Kahn, Loeb & Co. and later became director of various railroad, trust companies and corporations. Kahn has been a leading promoter of opera in the United States and was chairman of the board of directors of the Metropolitan Opera Company in New York from which he resigned in 1931. He is director of the Boston Opera Company, vice-president of the Chicago Grand Opera Company, and trustee of several institutions for higher education in the United States.

KAHN-TENGRI, a peak of central Asia, one of the extensive chain known as TIEN-SHAN, or Celestial Mountain. Khan-Tengri is a lofty spur reaching a height of 22,400 ft. above sea level. The highest point of the Tien-Shan system is Mt. Nicholas Mikailovitch, having a height of 22,670 ft.

KAIETEUR FALLS, waterfalls in British Guiana, on the Potaro River, tributary of the Essequibo. They were discovered in 1871 by C. Barrington Brown, and have since been visited and described by many travelers and authors.

It is to its wonderful surroundings more than to its magnitude that Kaieteur owes its almost unrivaled magnificence. The long winding ravine which leads up to the falls ends in a perfect amphitheater with cliff-like walls 822 ft. high, and into this basin the river tumbles bodily from the plateau higher up. A remarkable feature is a huge yawning cavern in the cliff behind the column of water, caused by the ceaseless back splash washing away the sandstone which underlies the harder conglomerate of the plateau. The rocks above and around the falls are covered with colorful vegetation and the pool below is encircled by black boulders, the water of the falls is white, the whole making the scene one of grandeur and beauty.

KAISARIA. *See* KAYSERI.

KAISER, GEORG (1878-), German playwright, was born at Magdeburg, Nov. 25, 1878. After receiving his education in the schools of Magdeburg, he engaged in business in Buenos Aires, and only entered on his career as dramatist upon his return to Germany in 1903. His early plays were satirical farces, but he gathered the momentum of social earnestness as he reached maturity of dramatic expression. *Die Judische Witwe,* 1911, is an example of his earlier work. One of his most famous plays, *Von Morgen Bis Mitternacht,* 1916, was produced with acclaim in England and the United States under the title, *From Morn to Midnight.* Kaiser has become increasingly recognized as an exponent of the ultra-modern expressionistic type of drama, of which *Zweimal Oliver,* 1927, is an example.

KAISERSLAUTERN, a city of the Bavarian palatinate, approximately 40 mi. west of Mannheim. It is noted for its large industries, the foremost being spinning and weaving. First mentioned in 800, Kaiserslautern received its name when Frederick I Barbarossa, built a castle there in the middle of the 12th century. It was a free imperial city from 1276 to 1357, when it was seized by the palatinate rulers. Pop. 1925, 59,336.

KAISER WILHELM CANAL. *See* KIEL CANAL.

KAISER WILHELM'S LAND. *See* NEW GUINEA.

KAIYUHKOTANA, an American Indian tribe belonging to the Northern Athapascan linguistic stock. They occupy the valley of the Yukon between Anvik and the Koyukuk River. Though formerly at odds with the Eskimo who live on their western boundaries, they have adopted many of their traits, especially in their food habits, following the Eskimo in placing their chief dependence on fish and oil. They are fine woodworkers and makers of bark canoes.

KAKAPO (*Stringops hagroptilus*), a curious, ground-dwelling parrot of New Zealand, called also owl-parrot. It is about 2 ft. long, with a thick swollen bill, short, weak wings, soft plumage barred with green and brown, and hairlike feathers arranged in a disk about the eyes as in many owls. Hiding in holes during the daytime, the kakapo comes out about sunset to seek the various vegetable substances on which it feeds. It nests in holes under trees or rocks and lays 2 or 3 white eggs.

KAKE, a sub-tribe of the Tlingit speaking a dialect of the linguistic stock of that name. They live

on Kupreanof Island, Alaska. Culturally they are more like the Southern Tlingit than the Northern Tlingit groups and are most closely related to the Henyah and Kuke. They have intermarried to some extent with the neighboring Athapascan peoples.

KAKEKT, a North American Indian tribe, now extinct. They spoke the Comox dialect of the Salishan linguistic stock and lived on the east coast of Vancouver Island.

KALAHARI DESERT, a tract of country in South Africa, 600 by 350 mi., which merges into the Bechuanaland plains on the south and reaches north to the borders of Rhodesia. The Kalahari is an elevated basin in which the ground falls gradually from north to south. The rapid drying up of the depression is to-day having an important effect on the country, for even in years of good rainfall a great part of South Africa is desiccated by hot, dry winds from the Kalahari.

The borders of the so-called desert are sandy, waterless lands where only prickly desert bush grows. The interior has much pasture land, generally poor in quality; its value varies from year to year according to the rainfall. Here there are considerable areas of sandy soil with little or no vegetation save for patches of stunted acacias and other trees. The baobab is occasionally seen and large numbers of big game inhabit the northern portion of the region.

KALAMATA, or **KALAMAI,** the principal city of the nomarchy of Messenia, situated about a mile from the sea on the Nedon in the southern Peloponnesus. Its harbor offers little shelter to vessels. Kalamata and the surrounding district produce and trade in oranges, olives, currants and other fruit. In 1770 and in 1821 Kalamata was the headquarters for the Morea of the Greek revolutionists. Pop. 1928, 28,955.

KALAMAZOO, a city of south central Michigan, the county seat of Kalamazoo Co., situated on the Kalamazoo River, 45 mi. south of Grand Rapids and midway between Detroit and Chicago. The city is a railroad center, served by the Pennsylvania, the Grand Trunk, the Michigan Central and the New York Central roads, and also by bus lines and a municipally owned airport. Near by, in the midst of rich prairies and oak woods, are numerous lakes well stocked with fish. Kalamazoo is noted for its cultivation of celery; vegetables, fruits, especially grapes, and grain are also raised in the vicinity. The city is an important industrial center, producing paper and paper products, drugs, machinery, stoves, and various other manufactures. In 1929 the factory output was worth $84,836,239. In 1929 the retail trade reached a total of $44,459,701. When Kalamazoo was founded, in 1829, it was called Bronson after Titus Bronson, a pioneer. Taking its present name in 1836, the settlement was incorporated as a village in 1838. For years Kalamazoo was the largest village in the United States; in 1884 it became a chartered city. Pop. 1920, 48,487; 1930, 54,786.

KALAMAZOO COLLEGE, at Kalamazoo, Mich., a privately controlled coeducational institution affiliated with the Baptist Church, was founded as the Michigan and Huron Institute in 1833. Later it became Kalamazoo Literary Institute, and in 1855 was chartered under its present name. The college had productive funds in 1931 of $1,975,566. The library of 25,000 volumes includes the Williams Mathematical Library. In 1931-32 there were 389 students, and a faculty of 31, headed by Pres. Allen Hoben.

KALAMAZOO RIVER, a river of Michigan, rising in Jackson Co. It flows generally northwest and enters Lake Michigan at Saugatuck. At this point the river is 350 ft. wide and forms a good harbor. Fifty-ton vessels can ascend it for 38 mi. to Allegan. The length of the Kalamazoo is estimated at 200 mi. and it furnishes extensive water power to the southwestern part of the state. Marshall, Kalamazoo, Battle Creek and Allegan are situated on its course.

KALAMEIN, a term applied to a type of construction in which a core of wood of exactly the shape of the finished article is completely covered with thin sheet metal. This results in a product which is practically fireproof and is used in the construction of doors, windows and trim for use in fireproof buildings.

KALB, JOHANN, BARON DE. *See* DE KALB, JOHANN, BARON.

KALE, a vegetable (*Brassica oleracea var. acephala*) much resembling the wild cabbage, various forms of which are known as borecole, marrow cabbage, or collard. Numerous kales have finely dissected leaves, especially the widely grown Scotch kales. The forms known as tree kales, with straight stiff stems, often grow 4 ft. tall; dwarf kales bear their leaves near the ground. The finer leaved varieties are boiled as a green vegetable. Very large kales, as the widely branching thousand-leaved kale, are grown as stock food.

KALEIDOSCOPE, a device consisting, in its simplest form, of two plane MIRRORS so placed as to produce symmetrical images. The long edges of the two mirrors are placed in contact, and the angle between them is carefully adjusted until it is an integral fraction of 360°. If an object be placed near one end of the mirrors and in the space between them, a symmetrical set of images of the object can be observed from the other end, due to multiple REFLECTION at the surfaces of the mirrors. In the most common form of kaleidoscope, these mirrors are mounted in a long tube with an eye-piece at one end. At the other end are two discs of glass separated by a small space which contains numerous pieces of glass of various shapes and colors. The outer disc is ground glass and the inner one clear. As the tube is rotated, an almost infinite number of beautiful designs is produced by the tumbling about of the glass fragments.

T. S.

KALEVALA (*Kalewala*), a modern collection of old Finnish legends, songs and heroic tales, comprising 22,793 lines (50 runes) in eight-syllabled trochaic verse. This remarkable work, collected from the peasants by Dr. Elias Lönnrot in 1835, augmented and

newly edited by him in 1849, is of an age not yet exactly determined, and tells the story of three heroes, Väinämöinen, Ilmarinen and Lemminkainen, who attempt to win the daughter of Louhi, a hero of the distant northern land, Pohjola. The poem opens with a strangely beautiful story of the Creation, and closes with a symbolical version of Christianity's triumph over paganism.

KALGAN, a city of Mongolia, the capital of the province of Chahar, situated 125 mi. northwest of Peking. The population is about 70.000. A railway now passes through the district, although the freight is still largely carried by camels. There are many factories engaged in the preparation of furs, skins to the value of over $30,000,000 being imported annually.

KALIDASA, Hindu poet and dramatist, lived, according to some authorities, in the 3rd century A.D., though others believe that the 6th century is a more probable date. As in the case of Homer, quite possibly there were several poets bearing the same name. Indeed Hindu astronomers use the term *Kalidasa* as the equivalent of a trio or three. Of the many poems and plays ascribed to Kalidasa, the most famous is SAKUNTALA, which is sometimes seen on the English and the American stage as *The Little Clay Cart.* The epic poems, *Raghuvamasa* and *Kumarasambhava,* the lyric poems, the *Meghaduta* and the *Ritusamhara,* and the other two dramas attributed to Kalidasa are also much admired and studied.

KALININ, MICHAEL IVANOVITCH (1875-), Russian political leader, son of a peasant, was born in the government of Tver, in 1875. He became a member of the Social-Democratic party and was twice arrested and banished. In 1919 Kalinin was chosen a member of the central committee of the Russian Communist party and of the central executive committee of the Soviet. He wrote *What is the Soviet Doing for the Realization of Democracy.*

KALISCH, ISIDORE (1816-86), American rabbi, was born in Krotoschin, Prussia, in 1816. He came to the United States at the age of 31 and was at once recognized as a learned rabbi, who, by word of mouth and pen, advocated liberalism in Jewish religious life. He occupied Reform Jewish pulpits in several cities in the East and Middle West. Among the best known of his literary works are *A Guide for Rational Enquiries into the Biblical Writings;* a collection of German poems entitled *Die Toene des Morgenlandes,* and an English translation of Lessing's *Nathan the Wise.* His *Studies in Ancient and Modern Judaism* appeared in New York in 1928. Kalisch died in 1886.

KALISPEL or **PEND D'OREILLES,** a North American Indian tribe of the Salish linguistic stock. They lived around Kalispel Lake and River in Idaho and Washington. The tribal remnants are now under the Flathead Agency in Montana and the Colville Agency in Washington.

KALISPELL, a city in northwestern Montana, the county seat of Flathead Co., situated 10 mi. northwest of Flathead Lake, and 160 mi. northwest of Helena. Bus lines and the Great Northern Railroad serve the city. There is an airport. Farm crops and lumber are the chief products of this region. The city has lumber and flour mills and creameries. There are many beautiful lakes in this section. Glacier National Park is only 35 mi. distant and in the vicinity are many lovely lakes. The city was founded in 1890; incorporated in 1892. Pop. 1920, 5,147; 1930, 6,094.

KALISZ, a city of the Polish voievodship of Lodz, situated on three islands in the Prosna River, 147 mi. west southwest of Warsaw. It has five Catholic churches, some with valuable ancient works of art, a Greek Orthodox, a Protestant church and a synagogue, a theater, schools and fine promenades. There are cloth factories and trade in grain. Kalisz was founded early in the history of Poland. Pop. 1931, 55,113.

KALLIKAK FAMILY, a pseudonym meaning in Greek the good-bad family and invented by Dr. Goddard in his widely quoted book on defective stock entitled the *Kallikak Family* (1912). The family tree was traced back to revolutionary days. Two branches were found and 480 descendents of a moronic maternal ancestor of one branch were studied; 143 proved to be feeble-minded and only 46 were regarded as normal. Of the rest 36 were illegitimate; 33 were prostitutes; 24 were alcoholics; 3 epileptics; 3 criminals and 8 keepers of brothels; and 82 died in infancy. On the good side of the family tree, namely its legitimate branch, 496 direct descendents were traced, all of whom were normal. This study led Dr. Goddard to conclude that feeble-mindedness is hereditary. Contemporary sociologists question the absoluteness of the distinction, and contend that the total blackness of one list and the total whiteness of the other would tend to cast the entire evidence under suspicion.

KALMAR, UNION OF, 1397. The union between Norway, Denmark and Sweden, of which Finland was a part, under one sovereign was effected in 1389 when Queen Margaret of Denmark and Norway became ruler of Sweden also. It was formally established in 1397 when Eric of Pomerania, 1396-1439, became King of the three countries. The union lasted till 1521, when it was dissolved by the revolt of Sweden under Gustavus Vasa. As was shown in 1883 by the Swedish scholar O. S. Rydberg, no treaty or formal act of union was ever accepted by the representatives or assemblies of the three countries, and the document upon which the union of 1397 was presumed to have rested, was only a tentative constitution drafted by some of the leading men of the time.

KALMIA, a genus of evergreen, rarely deciduous, shrubs of the heath family collectively known as American LAUREL. There are some seven species native to North America and Cuba, several of which are grown in various forms as ornamentals. They are mostly low shrubs with entire leaves and handsome flowers, borne usually in large clusters. The corolla tube has 10 folds or pouches in which the anthers are

held back, but, when touched, as by an insect, spring up violently and discharge their pollen. The best known species are the mountain laurel or calico bush (*K. latifolia*), the sheep-laurel or lambkill (*K. angustifolia*), the swamp laurel (*K. polifolia*), found across the continent, and the southern sheep-laurel (*K. carolina*). The foliage is more or less poisonous.

KALUGA, the administrative center of the Kaluga district in the Moscow Region of the R.S.F.S.R., situated about 115 mi. southwest of Moscow, at the confluence of the navigable Oka and Yaschenka rivers. It has been a trading center since the 14th century. Kaluga has good railway facilities. The principal local factories manufacture bricks, leather goods and sausage; there are also sawmills and smelting plants. The revolutionist, Ivan Bolotnikoff, and the "pseudo-Dmitri" ruled the town in the 16th century. Kaluga has been a place of exile for many deposed leaders. Between 1859-70 Shamil, the hero of the Caucasian mountaineers, lived here. A fine 17th century palace is now the State Regional Museum; nearby is the Lavrentyevsky Monastery. Pop. 1926, 51,565.

KAMAKURA, a seacoast city of Japan, seat of the Shogun government from the 12th through the 14th centuries. It is situated 11 mi. southwest of the seaport of Yokohama on the island of Honshu. Set among hills, it is a center for the devout, pleasure seekers and tourists. Many temples and the colossal Buddha, Daibutsu, erected in 1252, are its chief attractions. The Buddha stands 49 ft. 7 in. high and has a circumference of 97 ft. 2 in. Other historical buildings in the vicinity are the Hachiman Shrine dedicated to Emperor Ojin Tenno, God of War, and the splendid Koncho-ji Temple.

Preserved now for religious and historical interest, Kamakura in the 12th century was a rising city chosen as the seat of Yoritomo, first Shogun of the Minamoto clan. Bloody feuds reduced it to ashes repeatedly during that period, when the Shogun's court rivaled the Imperial one at Kyoto. Pop. 1925, 21,500.

KAME, a conical or hummocky hill, or short ridge formed by glacier-stream deposit. In northeastern America, Ireland, and Scotland groups of kames with intervening bowl-shaped "kettles," are often associated, and sometimes confused, with Eskers, differing, however, in that they tend to stand transverse to the ice-movement. Kame areas are often chosen as cemetery sites, or excavated for their sands and gravels.

KAMENEV, LEO BORISLOVICH (1883-), Russian political leader, son of an engineer, was born July 22, 1883. He was twice exiled to Siberia for his revolutionary demonstrations. Returning at the outbreak of the revolution of 1917, he became chairman of the Petrograd Soviet and in 1918 president of the Moscow Soviet. Opposing Stalin in the 14th Congress, 1926, he was expelled from the party but reinstated in 1928.

KANAWHA RIVER, a river of West Virginia, formed by the union of the New and Gauley rivers in Fayette Co. Its chief headstream, the New River, rises in the Blue Ridge Mountains in North Carolina and crosses Virginia into West Virginia. The Kanawha proper is a little over 100 mi. long but combined with the New River has a course of about 450 mi. It traverses a picturesque mountain region devoted to coal, salt and iron mining and empties into the Ohio River at Point Pleasant. The river is navigable by steamboats to Kanawha Falls, practically its entire length.

KANDAHAR, a fortified city of AFGHÁNISTÁN and capital of the province of Kandahar, situated in a fertile plain about 280 mi. southwest of KABUL. Well built, the city is surrounded by fortified walls and has a citadel. There are some 200 mosques and over 1,000 bazaars. Silk and felt are the chief articles of commerce, but fruits, corn and tobacco, which grow abundantly in the region, are exported. Like HERAT, Kabul is believed to have been founded by Alexander the Great. In the 19th century the city was occupied by the British, and thereafter it figured in the Anglo-Afghan wars, changing hands frequently until 1881, when the British finally abandoned it. Est. pop. 1931, 60,000.

KANDY, or **CANDY,** a city of Ceylon well situated near the center of the island on the banks of an artificial lake, about 70 mi. northeast of Colombo. Kandy was at one time the capital of the native kingdom of Kandy, but in 1815 Great Britain annexed the city. Relics of its former grandeur survive in the palaces of the former kings, and there are a number of beautiful Buddhist and Brahmin temples. The botanical gardens of Peradenia are notable. Pop. 1921, 32,562; 1931, 587,916.

KANE, a borough of McKean Co., northwestern Pennsylvania, situated 93 mi. southeast of Erie. Bus lines and two railroads afford transportation. Oil, gas and silica are found in this region. There are large tracts of timber. Kane is within the boundaries of the Allegheny National Forest and is considered a healthful resort for those suffering from pulmonary diseases. The borough has factories producing silk, plate glass, toys, leather goods, shirts, underwear, collars and handkerchiefs. Kane was founded in 1860 and incorporated in 1886. The remains of an Indian village, surrounded by an earth embankment, which is thought to be 700 years old, has recently been discovered 5 mi. away. Pop. 1920, 7,283; 1930, 6,232.

KANGAROO, any marsupial of the Australian family *Macropodidæ;* specifically the great, or old-man kangaroo (*Macropus giganteus*). These animals are characterized by the enormous development of the hind legs and prop-like tail. The small forelimbs are useful only as hands. In motion the kangaroo proceeds only by hops that become long leaps when at speed. Their food is wholly vegetable, and the larger kangaroos are gregarious grazers. The family contains a wide variety of forms and sizes, including the wallabies, and rock-kangaroos, and the arboreal tree- or rat-kangaroos. All these are harmless, their flesh is edible, and they furnish fur and leather. Vast herds of the larger kinds formerly in-

habited the Australian plains, but have been largely killed for the sake of their skins. Efforts are now being made to check this slaughter, and to protect the various species from extermination.

KANGAROO APPLE (*Solanum aviculare*), a shrubby perennial plant of the nightshade family native to Australia and New Zealand, closely allied to the potato. It grows 6 to 8 ft. high with long narrow leaves, numerous potato-like flowers borne in clusters, and yellow egg-shaped edible fruit. When fully ripe the mealy, slightly acid fruit is used for food by the natives.

KANGAROO-RAT (*Dipodomys ordii*), a small rodent of southwestern United States, similar in habit and appearance to the jerboa, having short forelimbs, long, powerful hind limbs and running swiftly in a series of leaps. In color it is buff above and white on the underparts with blackish parts on the rump and across the thighs. It is about 4½ in. long, the tail is longer than the body, and it possesses cheek pouches. Like the jerboa, it inhabits barren tracts and lives in elaborate burrows. It feeds upon the roots, blades and seeds of the scanty grasses. The name kangaroo-rat is also applied to a marsupial of Australia.

KANGAROO THORN, the name given to a spreading thorny species of ACACIA usually growing as wide as high, often planted for hedges.

KANG HSI (1654-1722), second Emperor of the Manchu Dynasty, who ruled China from 1662 to 1722. Kang Hsi came to the throne at the age of eight, upon the retirement of his father to a Buddhist monastery. He dismissed the board of regents and assumed full authority at the age of 13, in 1667. Prior to his reign, the Catholic missionaries had attained considerable influence at court, and for a time they hoped that he would be converted to Christianity. In 1692 Kang Hsi issued his Edict of Toleration which greatly encouraged the spread of Christianity, but dissensions between the Dominicans and Jesuits led him to cancel this edict and proscribe Christianity in 1717. Kang Hsi's reign was marked by a notable revival of literature, learning and art.

KANISIAN, an extinct language of Asia Minor preserved in a large number of CUNEIFORM tablets from the 15th to the 13th centuries B.C., found in 1906-07 at Boghaz-köi, a village on the site of the capital of the Hittite Empire. The language is usually called HITTITE or Psuedo-Hittite, but the former term seems best restricted to texts from Asia Minor written in HIEROGLYPHS. The linguistic affinities of Kanisian have been sharply disputed, but it is now generally acknowledged to be INDO-EUROPEAN and probably one of the *centum*-group (*see* CENTUM-LANGUAGES), although some maintain that it had separated from a common linguistic stock before the development of Indo-European proper. Its grammatical structure is quite clear in essentials, and its morphology seems genuinely Indo-European; on the other hand, though the contents of its texts are, generally speaking, fairly certain, thanks to parallel passages in ACCADIAN, its vocabulary is extremely obscure and evidently contains a large proportion of words borrowed from languages spoken in Asia Minor before the Kanisians had entered that region, further difficulty being caused by the ambiguity of cuneiform writing (confusion of *p* and *b*, of long and short vowels, etc.). The literature consists of Sumero-Accadian-Kanisian glossaries, a legal code, diplomatic documents, religious texts, letters, etc. L. H. G.

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KANKAKEE, a city in eastern Illinois, the county seat of Kankakee Co., situated on the Kankakee River, 56 mi. south of Chicago. Buses and the Illinois Central and the New York Central railroads afford transportation. There is a privately-owned airport. Kankakee is located in a grain-growing and dairying region. Near by are limestone quarries. The chief local manufactures are furniture, hosiery, office supplies, metal ceilings, floorings, bird houses, paints, stoves and farming implements. In 1929 the factory output amounted approximately to $12,000,000; the retail trade was valued at $14,986,955. Located here or near by are a state armory, a State Hospital for the Insane and St. Viator's College. Rock Creek Canyon and Falls make up a scenic spot about 9 mi. northwest of the city. Kankakee was plotted as Bourbonnais in 1835, and was incorporated under its present name in 1854. Pop. 1920, 16,753; 1930, 20,620.

KANSA, a North American Indian tribe belonging to the Dhegiha group of the Siouan linguistic stock. Their closest affiliations were with the Osage and Quapaw. Early in the historic period they were settled at the mouth of the Kansas River and later migrated up the river to Big Blue River and Council Grove, Kan. From here they were moved to a reservation in Oklahoma where they now are. Culturally they show affiliations to both the Plains and Woodlands peoples. Formerly they lived in earthlodges most of the year and sometimes used skin tipis or the dome-shaped lodge of the Eastern Woodlands. They hunted the buffalo, cultivated the soil as well, had an exogamous gentile organization, a few societies, and war bundles which were the property of the gens. Their costume was most like that of the Eastern Woodlands.



KANSAS STATE SEAL

KANSAS, one of the middle western states of the United States lying exactly in the geographical center of the country and popularly called the "Sunflower State." It is situated between 37° and 40° N. lat. and 94° 38′ and 102° 2′ W. long. On the north it is bounded by Nebraska, on the east by Missouri, on the south by Oklahoma and on the west by

Colorado. Kansas comprises an area of 82,158 sq. mi., inclusive of 384 sq. mi. of water surface. Kansas forms a rectangle with a length about 400 mi. from east to west and extending 210 mi. from north to south. In size Kansas ranks thirteenth among the states of the Union.

Surface Features. Kansas falls within two main topographical regions. The western one-third of the state belongs to the semi-arid Great Plains, and the eastern part to the humid central lowland or prairie plains. The former declines to the latter across a broad belt of irregular east-facing escarpments called the Break of the Plains.

The Great Plains in Kansas come within the subdivision known as the high plains, a level uneroded region covering eastern Colorado and extending southward into Texas. In the southwestern corner of the state there is a wide expanse of sand hills. Eastern Kansas is locally known as the Osage Plains.

The state has a mean elevation of 2,000 ft. above sea level. The maximum altitude, 4,135 ft. occurs on the western boundary in Wallace County, and the minimum, 700 ft., on the southern boundary in Montgomery County. Two long rivers, the Kansas and Arkansas, cut shallow valleys across the state.

Climate. Owing to its central location, Kansas has a continental climate. The mean annual temperature is 54.5° F. At Dodge City the average is 29° F. for January and 78.4° F. for July. During the period, 1887-1930, the highest temperature recorded in Kansas was 116° F. and the lowest, —40° F. The average annual precipitation is 26.9 in., including 17 in. of snow, ranging from an average of about 34.8 in. in the east to 26.7 in. in the middle section and 19.2 in. in the west. Crops thrive for some 150 or more days between times of killing frost.

Forests and Parks. Strictly speaking, Kansas has no forests. The principal wooded tracts fringe the rivers and streams and are chiefly used as pastureland. In the valleys of the eastern and southeastern parts of the state there were originally quite heavy stands of hard woods in which walnut predominated with some elm, white ash, linden, oak, sycamore, hackberry and willow. These areas have been largely cut or burned over. Farther west cottonwood and box elder are the principal trees. With the control of fires, woodlands are rapidly extending up ravines and hillsides and there is extensive replanting, chiefly, with pecan, walnut, chinese, elm, western yellow pine, and bur and white oak species. Kansas cooperates with the Federal Government under the Clarke-McNary Law and in 1930, 62,600 trees were distributed for planting on farm lands. Extensive game preserves have been established on privately owned property. State parks are under the supervision of the State Fish and Game Commission. This Commission has adopted the slogan "Build a Lake; Plant a Bush; Grow a Tree." As a result the chief feature of Kansas parks is usually a man-made lake used for boating, bathing, and fishing with camping and restricted hunting permitted in the woods along its shores. Such woodland parks are located in Meade, Neosho, Scott, Crawford and Ottawa counties. The Meade County State Park, also a big game preserve, is stocked with buffalo, elk, deer, and antelope. Kansas has three state monuments, the John Brown and Pawnee Rock memorials which are used as camping grounds and Fort Hayes, a 200-acre golf course and picnic grounds.

Minerals and Mining. Kansas possesses mineral resources of great value. Among these are petroleum, natural gas, coal and zinc found in the eastern and southeastern counties; rock salt which occurs in immense beds underlying Rice and other south-central counties, and widespread and inexhaustible supplies of limestone for building and the manufacture of cement.

With mineral productions for 1929 amounting to $124,472,840 Kansas stood twelfth among the states, ranking third in zinc and salt, fourth in petroleum and fifth in lead. The outstanding product was petroleum, 42,813,000 bbls. valued at $62,510,000. Other important products in order of value were zinc, 109,850 tons, $14,500,200; natural gas, 38,469,000 M cu. ft., $13,429,000; cement, 6,855,861 bbls., $10,041,282; coal, 2,975,971 tons, $6,952,829; salt, 840,370 tons, $3,761,984; lead, 26,596 tons, $3,351,096; clay products, $3,279,953; limestone, $2,108,325; and sand and gravel, 3,389,783 tons, $1,879,899.

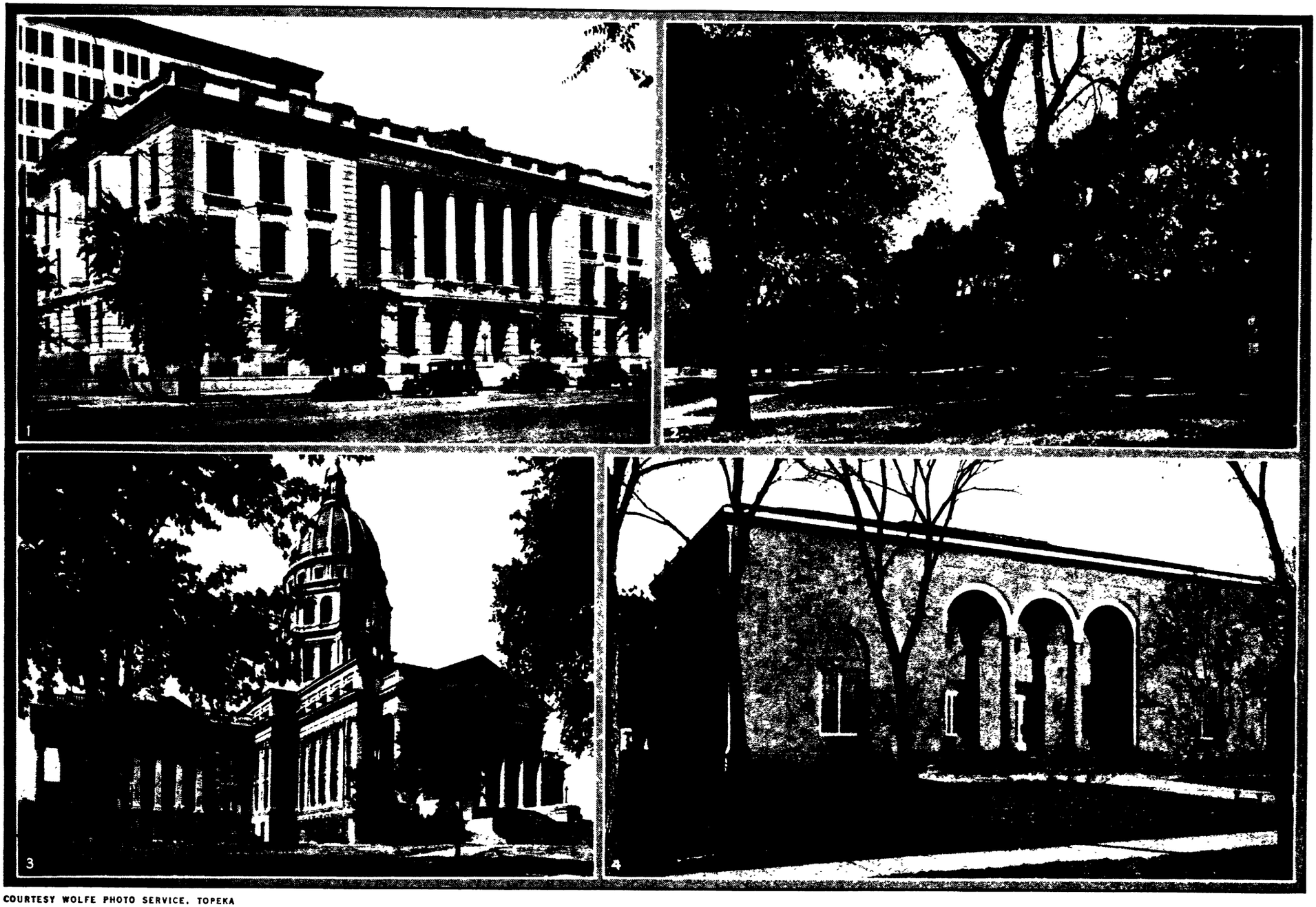
During 1929 292 mines and quarries gave employment to 7,938 persons who received $9,492,756 in salaries and wages.

Soil. Kansas exhibits in general soils of marked fertility. The northeastern part of the state is covered with glacial drift deposits of exceptional richness, similar to those of Iowa and Illinois. Almost equally fertile are the soils of central and southeastern Kansas, comprised of a dark clay loam derived from the decomposition of underlying rocks. Erosion of the Rocky Mountains has brought some productive soil to western Kansas; the extreme southwest, however, is decidedly sandy. Many river valleys throughout the state are covered by a sandy loam and some bottom lands possess deposits of rich alluvium.

Agriculture. Kansas, which ranks high as an agricultural state, is noted for the production of winter wheat.

In 1930 46,975,647 ac. or 89.8% of the entire land area was in farms, 166,042 in number, with an average size per farm of 282.9 ac. and an average value per acre of $48.56. Of the farm area 26,535,054 ac. or 56% was crop land; 18,687,425 ac. or 40%, pasture land; and 328,216 ac. or about 1%, woodland. The total value of farm property was $2,695,594,760, of which $2,281,101,631 was represented by land and buildings; $167,785,230, by implements and machinery; and $246,707,899, by domestic animals.

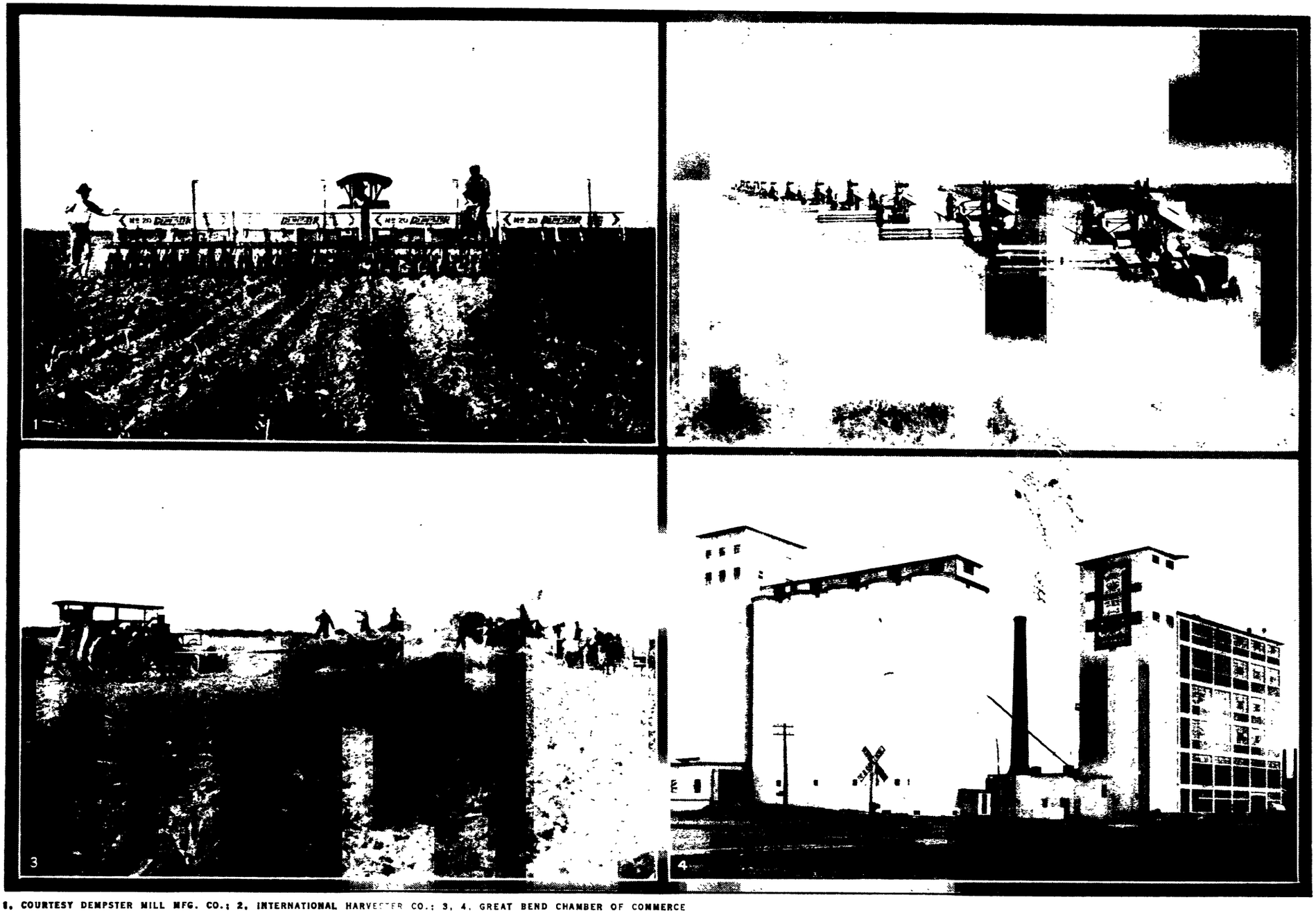
According to the census of 1930 Kansas produced in 1929 field crops to the value of $299,152,090, ranking sixth among the states. It stood first in wheat, eighth in corn, ninth in barley and eleventh in grapes. The chief crops were grains $245,853,958, hay and forage $38,317,849, vegetables $10,078,029, and fruits $3,670,718.



COURTESY WOLFE PHOTO SERVICE, TOPEKA

TOPEKA, CAPITAL OF KANSAS

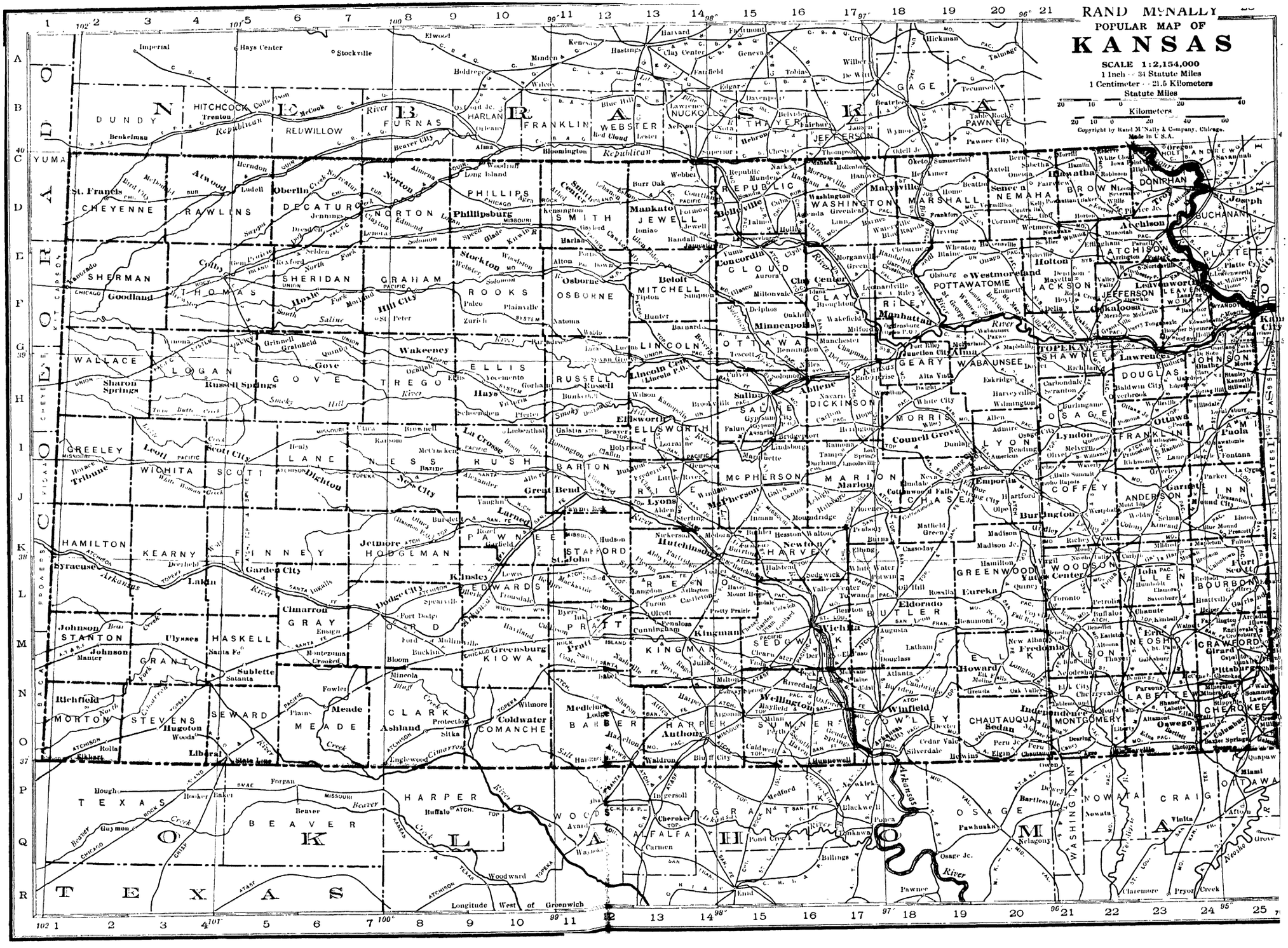
1. Memorial Building, containing collections of the State Historical Society. **2.** A park in the heart of Topeka's residential district. **3.** The State Capitol Building, Topeka. **4.** Mulvane Art Museum, Washburn College, Topeka.



1, COURTESY DEMPSTER MILL MFG. CO.; 2, INTERNATIONAL HARVESTER CO.; 3, 4, GREAT BEND CHAMBER OF COMMERCE

KANSAS—THE HEART OF THE WHEAT COUNTRY

1. Farming 50,000 acres. Four seeding machines pulled by one tractor. **2.** Twelve reapers cutting a swath 192 ft. wide, or about 640 acres a day. **3.** Threshing wheat. **4.** Grain elevators and flour mill in western Kansas.


RAND McNALLY
POPULAR MAP OF
KANSAS
SCALE 1:2,154,000
1 Inch = 34 Statute Miles
1 Centimeter = 21.5 Kilometers
Statute Miles
Kilometers
Copyright by Rand McNally & Company, Chicago.
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COLORADO
NEBRASKA
MISSOURI
OKLAHOMA
TEXAS
Longitude West of Greenwich

Wheat and corn are the leading grain crops. Wheat, grown on 12,081,021 ac., yielded 148,482,595 bu. Of 6,642,501 ac. devoted to corn, 5,648,934 ac. harvested for grain produced 101,355,511 bu., and 184,264 ac. cut for silage yielded 900,121 tons. Other grain crops were oats 21,526,565 bu., barley 9,466,268 bu. and flax 107,649 bu. Of the hay crop of 2,628,-183 tons, alfalfa contributed 1,324,660 tons and wild grasses 952,530 tons.

Among the vegetables were potatoes valued at $5,-843,908; sweet potatoes, $563,399; tomatoes, $343,186, and watermelons, $269,892. The principal fruits were apples 1,307,848 bu., peaches 256,040 bu., pears 255,-923 bu., grapes 9,177,412 lbs., and strawberries 4,455,-175 qts.

Farm products sold by cooperative marketing fell from $44,290,957 in 1919 to $36,396,390 in 1929 and farm supplies purchased by this method, from $9,-663,051 to $5,046,612. Farm machinery and equipment in 1930 included 171,018 automobiles, 33,648 motor trucks, 66,275 tractors, 7,463 electric motors and 38,861 stationary gas engines.

Irrigation. In limited areas, chiefly in the valley of the Arkansas River from the vicinity of Dodge City westward to the Colorado border, irrigation has been established since about 1880. By 1890 two-thirds of the area reported under irrigation in 1930 had been developed.

According to the Census of 1930 the total number of irrigated farms was 683, with an aggregate area of 311,174 ac., of which 71,290 ac. were irrigated. Including land and buildings the value of all irrigated farms was $12,294,425, or an average of $39.51 per ac. The total investment in irrigation enterprises to 1930 was $1,685,652, and the average cost of maintenance and operation for 1929 was $1.52 per ac.

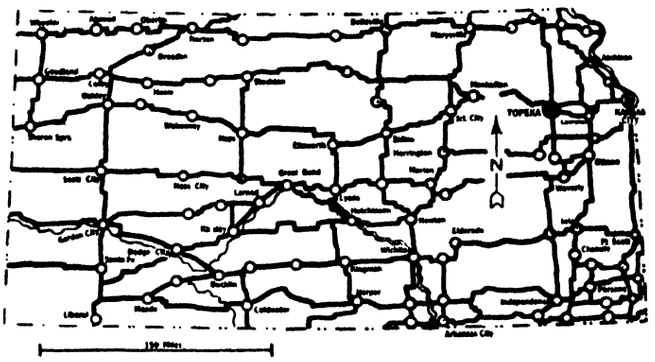
Animal Industry. Cattle-raising, hog-raising and poultry growing are the chief livestock interests. According to the census of 1930 the rank of Kansas among the states was fourth in cattle, sixth in horses and ninth in swine; it stood fifth in chickens raised and seventh in chicken eggs produced. The state ranked eighth in total value, $246,707,899, of domestic animals. Among these were 3,223,772 cattle reported from 148,217 farms or 89% of all farms in the state and valued at $155,816,006; horses, 714,860 in number valued at $33,781,689; mules, 151,470, $9,711,406; swine, 2,473,084, $29,497,108, and sheep, 574,336, $3,575,298.

Of the cows on farms, 817,573 were kept mainly for milk production and 618,752 mainly for beef production. In 1929, 326,192,822 gals. of milk were produced; the total value of dairy products marketed was $37,232,441, including $24,242,641 for cream sold as butterfat. The value of all poultry raised was $25,-450,460. The number and value of the chief kinds were chickens, 33,650,321, $24,345,115; turkeys, 319,-480, $797,403; ducks, 215,955, $163,825, and geese, 110,175, $144,117. The chickens sold, 12,816,459 in number, were valued at $9,711,751. Of 135,541,898 doz. chicken eggs produced, valued at $34,587,957, 107,348,039 doz., with a value of $27,408,272, were marketed. The sheep industry yielded 2,170,366 lbs. of wool valued at $629,896. Honey, reaching a total of 1,433,447 lbs. valued at $214,784, was produced from 59,971 hives.

Fisheries. Kansas has a small annual fish catch, in 1930 amounting to 178,000 lbs., worth $21,000. In this year the state issued 81,299 fishing licenses and received $81,299 in fees. Three hatcheries are operated by 11 men at a cost of $38,000; the output for 1930 was 200,000 bass and 550,000 other game fish.

Transportation. In 1860, the first locomotive entered Kansas on the tracks of the Union Pacific Railroad. Since that time a network of steam railways has been built across the state. In 1930 the total railway mileage of the state was 9,342, the fifth largest in the United States. The principal systems include the Rock Island, Union Pacific, Santa Fé, Missouri Pacific, Burlington, Missouri, Kansas & Texas and the St. Louis & San Francisco.

The state's highway systems are showing constant improvement and extension. On Jan. 1, 1930, there was an aggregate of 137,929 mi. of highways, including 5,685 mi. of surfaced roads and 3,464 mi. of state highways. During 1929, there was a total highway expenditure of $34,237,913. Of this amount, $14,-052,713 was paid by the state and $24,775,603 by county and local governments. The state gasoline tax produced total earnings of $9,120,491 in 1930. Motor vehicle registrations were 594,523 in 1930, compared with 457,033 in 1925. The rapid development of trucking facilities is indicated by the 1930 registration of 83,139 trucks, an increase in registration over 1925 of 36,074 trucks, or over 76%. During the same five-year period, the number of buses in operation increased from 577 to 841.



KANSAS STATE ROADS

Manufactures. Though the chief industrial activities of the state are agricultural, Kansas has developed substantial manufactures. These are based in the main upon the utilization of the state's extensive grain, livestock, and mineral productions.

According to the Census of 1930 Kansas with manufactures for 1929 valued at $751,613,194 stood nineteenth among the states. Its 1,916 establishments gave employment to 9,968 officers and employees, who received $21,861,198 in salaries and to 47,373 wage

earners, who were paid $63,348,328 in wages. These factories used a total of 298,487 horse power, expended $13,626,688 for fuel and power, and $532,619,887 for materials and supplies, and added by the process of manufacture $205,366,619 to the value of their output.

This output is set forth under 63 separately enumerated products. Among these Kansas stood second in meat packing and flour milling and eighth in petroleum refining. The outstanding products were packed meats valued at $273,586,689; flour, $121,365,753, and refined petroleum, $98,329,442, which comprised two-thirds of the total manufactures of the state. Among minor manufactures were steam railroad carshop construction and repair, $27,456,328; butter, $26,968,057; printing and publishing, $20,261,774; foundry and machine shop products, $15,206,477; dressed poultry, $11,832,336, and bread and bakery products, $11,668,039.

The principal manufacturing centers are Kansas City, with products, mostly packed meats, valued at $302,000,000; Wichita, $64,000,000; Topeka, including all factories in Shawnee Co., $40,000,000, and Coffeyville, $20,000,000.

Commerce. According to the census of 1930, there were in 1929 4,323 wholesaling establishments in Kansas, with total sales of $1,020,676,856. These organizations gave full time employment to 22,975 men and women, whose annual salaries aggregated $35,177,481. The chief wholesaling centers are Wichita, Hutchinson and Coffeyville, with Topeka and Kansas City also important.

The total sales of the 26,020 retail stores amounted to $798,599,763; sales per store averaged $30,691; sales per capita were $424.56.

CHIEF RETAIL DISTRIBUTING GROUPS

Group	*No. of Stores*	*Sales*	*% of Total*
Automotive	6,545	$203,713,879	25.51
Food	5,289	137,488,898	17.22
General Mdse.	2,587	120,026,091	15.03
Lumber & Bldg.	2,167	83,450,398	10.45
Apparel	1,440	38,947,187	4.88
Furn. & Household	888	29,216,490	3.67
All other stores	7,104	185,756,820	23.24
Total, all stores	26,020	$798,599,763	100.00

Finance and Banking. The assessed value of all taxable Kansas property in 1929 was $3,813,146,990. The total bonded debt in 1930 was $23,500,000 represented by soldiers' bonus bonds. Total state revenues in 1928 were $27,005,310. The chief sources of revenue were property and special taxes, $9,369,000, and licenses, including insurance, motor vehicle and gasoline taxes of $4,924,419. Total expenditures were $28,676,455. The principal payments were for highways, $12,649,625, and operation of general departments, $15,029,532.

There were 1,002 banks in Kansas in 1930. Of these, 243 were national banks, 756 state banks and trust companies and 3 private banks. Their total capital was $44,100,500; their surplus and undivided profits, $29,315,000. Total resources were $503,507,000, with loans and discounts aggregating $276,426,000. Demand and time deposits amounted to $375,234,000. Per capita demand and time deposits were $199.59; per capita savings deposits, $51.13. The total savings of $96,121,000 were owned by 244,311 depositors. National bank circulation aggregated $9,486,000.

Government. The law-making power of Kansas is vested in a legislature consisting of a senate composed of 40 members and a house of representatives of 125 members, the former elected for terms of four years and the latter for terms of two years. They meet in biennial sessions limited in duration to 50 days. A governor, lieutenant governor, secretary of state, auditor, treasurer, attorney-general and superintendent of public instruction all elected for two years make up the executive department. The governor receives a salary of $5,000 per annum. Judicial power is vested in a supreme court, district courts, probate courts and justices of the peace. The supreme court consists of seven judges elected for terms of six years at $4,000 a year.

Social Welfare Institutions. The State Board of Administration supervises these institutions. A school for the blind is maintained at Kansas City and one for the deaf at Olathe. Winfield has a state school for feeble-minded youths and Atchison an orphans' home. The Mother Bickerdyke Home for widows and children of old soldiers is at Ellsworth and the soldiers' home at Ft. Dodge. The tuberculosis sanatorium is at Norton. Hospitals for the insane are at Topeka, Larned and Osawatomie, and for epileptics at Parsons. The counties take care of most of the poor relief. The girls' industrial school is at Beloit and the boys' at Topeka. The penitentiary and also a women's industrial farm are at Lansing. Hutchinson has a reformatory for young criminals.

Education. The first school for white children was opened at Wyandotte, now Kansas City, in 1844. Eleven years later, the free school system in Kansas was begun with the opening of a school at Lawrence. In 1928 there were 13,812 teachers and 338,473 pupils in the 7,200 public elementary schools and 5,329 teachers and 86,951 pupils in the 723 public high schools. All children from 8 to 15 years of age are required to attend school the full school term.

The number of persons 5 to 20 years of age attending school in 1930 was 433,116, or 74.7% of the population within the ages specified, as compared with 389,497, or 69.8% in 1920. Persons 10 years and over who were unable to read and write in 1930 numbered 18,680, or 1.2% as compared with 22,821, or 1.6% in 1920.

Among the state institutions of higher learning are the University of Kansas at Lawrence, the Kansas State Agricultural College at Manhattan; normal schools at Emporia, Hays and Pittsburg, and Western University (for Negroes) at Kansas City. Important privately controlled institutions include Kansas Wesleyan University at Salina, Kansas City University, Ottawa University at Ottawa, Baker University at Baldwin and the College of Emporia. The Kansas

Traveling Libraries Commission has headquarters at Topeka.

Population. In 1930 Kansas ranked twenty-fourth among the states with a population of 1,880,999 or an average of 23.0 per square mile, an increase of 111,742 or 6.3% over 1920. The population rose from 107,206 in 1860 to 1,470,495 in 1900, 1,690,949 in 1910 and to 1,769,257 in 1920. In 1930 there were 1,792,847 or 95.3% whites, 66,344 or 3.5% Negroes, 19,150 or 1.0% Mexicans, and 2,454 or 0.1% Indians. Of the whites, 1,723,131 were native born, and 69,716 were foreign born. Of the total foreign stock, including foreign born, and foreign and mixed parentage, 107,380 or 31.6% were German, 36,400 or 10.7% Russian, 30,925 or 9.1% English, 28,200 or 8.3% Swedish, and 20,092 or 5.9% from the Irish Free State. The rural population was 1,151,165 or 61.2% of the total, a decrease of 128 from 1920; the urban population was 729,834 or 38.8% of the total, an increase of 111,870 or 18.1% since 1920. There were in 1930 five cities with a population of 20,000 and upwards: Kansas City, 121,857; Wichita, 111,110; Topeka, 64,120; Hutchinson, 27,085; Salina, 20,155.

Occupations. In 1930 694,232 persons, or 36.9% of the population, were gainful workers 10 years old or older; 82.8% of these were males and 17.2% were females; 89.8% were native white; 4.7% foreign-born white; 4.4% Negro, and 1.1% other races.

In agriculture, the principal occupation, 229,390 persons were engaged; of these 162,812 were farmers and 46,756 farm wage workers. Among other important occupations, with number of workers, were manufacturing, 131,715; trade, 89,312, including 25,427 retail dealers and 28,747 salespersons; transportation and communication, 67,470, including 11,314 chauffeurs; domestic and personal service, 59,459; professional service, 50,571, including 22,610 school teachers, 4,205 men and 18,405 women; clerical service, 39,793, and mining, 14,286.

HISTORY

Coronado in 1541 led a Spanish expedition across Kansas. Spanish and later French traders who have left no sure identification occasionally came to trade with the Shawnee, Osage, and Omaha tribes of the region. A French expedition from Louisiana, headed by Du Tissenet, visited the Missouri valley in 1719. A final Spanish attempt to establish a post in the Kansas country was frustrated by the Indians, who remained in undisturbed occupation until several years after the transfer to the United States, as part of the LOUISIANA PURCHASE of 1803, of the greater portion of the present Kansas. The area west of longitude 100° and south of the Arkansas River was included in the land cession of Texas to the Federal Government in 1850. The LEWIS AND CLARK EXPEDITION reached Kansas in June, 1804; ZEBULON M. PIKE in 1806 crossed the territory; Major Stephen H. Long explored it extensively in 1819. The famous Santa Fe Trail, the artery of pioneer commerce between the Great Bend of the Missouri and Santa Fe, northern Mexico, traversed Kansas for 400 of its 780 miles. Fort Leavenworth, founded in 1827, was the first and most important garrisoned post in Kansas. As the overland emigration to the Far West swelled in volume, occasional "ranches" were established to supply the wants of emigrants or of the soldiers stationed to prevent Indian depredations. Tribes from localities east of the Mississippi were removed to Kansas, and Christian missionaries were established among the villages. In 1854 the population of Kansas was estimated at 700. Since the dissolution of the Territory of MISSOURI in 1821 the region had been unorganized. Kansas was created a Territory in 1854 (*see* KANSAS-NEBRASKA ACT); the question of slavery was left for decision by the inhabitants of the territory in framing their constitution.

Kansas became the storm center of the slavery agitation. Lawrence, Topeka, Osawatomie and other towns were founded by emigrants from free states; Leavenworth, Atchison and Lecompton were among the pro-slavery towns settled in 1854. The free state element had a numerical advantage, temporarily overbalanced by incursions of Missourians to carry the polls (*see* KANSAS BORDER RUFFIANS) and the pro-slavery influence of Presidents Pierce and Buchanan. The first territorial legislature convened at Pawnee, July 2, 1855; the free state men refused to recognize its legality, and, in convention at Topeka, Oct. 23, 1855, adopted a state constitution prohibiting slavery, and elected a separate slate of officers. The sacking of the town of Lawrence by a pro-slavery mob on May 21, 1856, was followed two days later by the massacre of five pro-slavery men by John Brown and his sons at Pottawatami Creek, and virtual civil war ensued until suppressed by Federal troops. Immigration from the North within the next two years gave the free state faction indisputable preeminence; a constitution prohibiting slavery, adopted at Wyandotte on July 27, 1859, was ratified on Oct. 4 by 10,421 votes to 5,530. On Jan. 29, 1861, Kansas was admitted to the Union, and Topeka was named the capital. In 1880 the state enacted PROHIBITION by constitutional amendment. Intermittently Republican or Democratic in national politics, Kansas in 1932 gave its nine electoral votes to Roosevelt, elected Alfred M. Landon, Republican, governor, and George McGill, Democrat, senator.

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KANSAS, UNIVERSITY OF, at Lawrence, Kans., a state university for men and women, organized in 1865. The institution was opened with preparatory and college departments, the former being discontinued in 1891. The university is at the head of the free public school system of the state. On the main campus there are schools of Business, Education, Engineering, Fine Arts, Law and Pharmacy, the College of Liberal Arts and Sciences, and the Graduate School. The School of Medicine is located partly at Lawrence and partly at Kansas City. The

major support of the university is obtained from state appropriations. The library of 232,000 volumes contains special collections on Shakespeare and the French Revolution. In 1931-32 there were 4,126 students, and a faculty of 250 headed by Chancellor ERNEST HIRAM LINDLEY.

KANSAS BORDER RUFFIANS, 1854-60, Missourians who invaded Kansas to terrorize antislavery residents and to uphold slavery at the polls. The KANSAS-NEBRASKA ACT provided that the question of slavery in the proposed states be determined by the inhabitants. Hoping to ensure the admission of Kansas as a slave state to increase the proslavery strength in Congress, and fearful of the escape of their slaves across the border should Kansas become a free state, bands of "border ruffians" attempted to overawe the antislavery element in the territory. Their most notorious exploit was the sacking of Lawrence, Kans., May 21, 1856.

KANSAS CITY, the largest city of Kansas and the county seat of Wyandotte Co., situated on both banks of the Kansas (Kaw) River at its convergence with the Missouri. It is contiguous with Kansas City, Mo., from which it is divided by the eastern boundary line of the state, and the commercial activities of the two cities are practically interdependent. It occupies a rectangular site approximately 7 mi. long and 3 mi. wide, flat between the two rivers with bluffs rising sharply on the opposite banks. The city is characterized by fine public buildings, parks, and playgrounds, and it is the seat of a number of educational institutions including the Advanced School of Medicine of the University of Kansas and the State School for the Blind. A unique feature is a great viaduct linking the city with Kansas City, Mo. Transportation facilities include the Santa Fe, Rock Island, Missouri Pacific, St. Louis & San Francisco, and Union Pacific railroads, air, trolley and bus lines.

Kansas City is the center of the economic life of the state, being the second largest livestock market and meat-packing center of the United States. Its other important industries include the refining of petroleum, flour milling, and the manufacture of soap, chemicals, boxes, cooperage, structural iron, and fertilizers. According to the Census of 1930 its manufactures for 1929 were valued at about $302,000,000, chiefly packing house products, while its wholesale trade proper amounted to $23,882,597 and its retail trade to $40,875,015.

The present city was founded in 1886 by the consolidation of Kansas City, Wyandotte, and Armourdale. Wyandotte was settled in 1857 and incorporated as a town in 1858 and as a city in 1859. It was here that the Wyandotte constitution was framed in July 1859 under which Kansas was admitted to the Union as a state. The original Kansas City was surveyed in 1869 and was incorporated as a city in 1872. Armourdale was laid out in 1880 and incorporated in 1882. Kansas City has had the commission form of government since 1909. Pop. 1920, 101,177; 1930, 121,857.

KANSAS CITY, a city of Jackson Co., Missouri, and the second city of the state in size and importance. It is situated on the western border of Missouri, adjoining Kansas City, Kan., about 285 mi. west of St. Louis. The city lies on the Missouri River at the mouth of the Kansas River. It is served by twelve trunk railway systems and numerous branch lines. Its Union passenger station, built in 1914 at a cost of $6,000,000, is exceeded in size only by those of New York and Chicago. Additional transportation facilities are provided by air-mail routes and by interurban trolley, bus and truck lines radiating in all directions.

The city is built largely on hills and is noted for its picturesque drives and extensive park system. There are over 20 parks in the city, and all are connected by its beautiful highways. The industrial sections lie principally along the Missouri and Kansas rivers. Liberty Memorial, 218 ft. high, faces the station. At the top of the column a light is kept burning at all times.

Kansas City, Mo., and Kansas City, Kan., though separated by a state boundary line, are really industrially and residentially a single community. The residential sections of the community are principally in Missouri, with the seat of the meat-packing and flour-milling industries largely in Kansas.

Kansas City is a natural distributing point for the rich surrounding agricultural region. Though meat-packing and flour-milling are its principal industries, it is also a great marketing and wholesaling center. It is a primary market for hay, hogs, cattle, winter wheat, horses and mules. Its 1,525 wholesaling organizations distributed $1,378,453,974 worth of merchandise in 1929, with agricultural implements, lumber, seeds, corn, meat, fruits, butter and eggs the largest items. Its manufactures included food products, flour and structural steel. In 1929 the value of the factory output was about $341,000,000; the wholesale trade amounted to $903,604,698. The 6,274 retail stores, which did an aggregate business of $354,621,797, gave full-time employment to 34,765 people.

Kansas City was first settled about 1821. It was incorporated as a town about 1850 and rechartered several times under its power of home rule. Its present charter, adopted in 1926, provides for a council-manager form of government. Pop. 1920, 324,410; 1930, 399,746.

KANSAS-NEBRASKA BILL, an act approved May 30, 1854, for the territorial organization of the region between Missouri and the Rocky Mountains, i.e., the remainder of the LOUISIANA PURCHASE. The bill, introduced by Senator STEPHEN A. DOUGLAS Jan. 23, 1854, provided that this domain be organized into two territories, Kansas and Nebraska, and that the slavery restriction of the MISSOURI COMPROMISE "is hereby declared inoperative and void." It was a revision of the bill introduced by Douglas on Jan. 4, providing for a single territorial government to embrace the domain. Douglas was fundamentally interested in facilitating the construction of the Pacific Railroad, and to him the question of slavery in the

proposed territories was a minor issue, which he hoped to settle by the principle of POPULAR SOVEREIGNTY. However, prolonged and bitter debate renewed the sectional controversy over slavery, which had been regarded as settled by the COMPROMISE OF 1850. The reopening of the controversy disrupted the Whig Party, caused a revolt among the anti-slavery Democrats, and was the leading factor in the birth and growth of the REPUBLICAN PARTY.

KANSAS RIVER, a stream of northern Kansas. It is formed by the confluence of the Smoky Hill and Republican rivers at Junction City in Geary Co. Its headstreams rise in eastern Colorado and cross the gently sloping open plains, receiving numerous tributaries before combining. The trunk stream flows eastward, receives the Big Blue at Manhattan, and joins the Missouri at Kansas City. Including the Smoky Hill, the river measures 654 mi. and the Republican River contributes 227 mi. The drainage basin of 59,256 sq. mi. is treeless prairie and comprises the richest agricultural section of the state. Topeka is located on the main stream.

KANSAS STATE AGRICULTURE COLLEGE, a state-controlled coeducational institution at Manhattan, Kans. Organized in 1863 under the provisions of the Morrill Land-Grant Act, it took over the grounds, buildings and equipment of Bluemont Central College, founded in Manhattan in 1858. The college comprises divisions of Agriculture, Engineering, General Science, Home Economics, Veterinary Medicine and College Extension. It maintains Agricultural and Engineering Experiment Stations and a Bureau of Research in Home Economics. The major support of the college is obtained from Federal and state appropriations. The library contains 94,000 volumes. In 1931-32 there were 2,894 students, and a faculty of 450, headed by Pres. Francis D. Farrell.

KANT, IMMANUEL (1724-1804), German philosopher, was born at Königsberg, Apr. 22, 1724. He studied at the University of Königsberg, 1740-46, and for the next nine years was a private tutor. In 1755 he received the doctorate and became a *Privatdocent* in the university. Becoming a full professor in 1770, he continued to lecture until 1797. Although a frail youth, Kant lived to the ripe old age of 80 and enjoyed good health. But it was only by persistent effort and a methodical life that he maintained his health. An eccentric individual, he was so regular in his habits that the neighbors used to set their clocks by his daily walks. He was born, lived and died at Königsberg, and throughout his long life he never journeyed more than 20 miles from his native city. Hence he is sometimes called the Sage of Königsberg. Kant died Feb. 12, 1804.

Kant's most important works are his three critiques which together constitute the critical philosophy. His greatest work is *The Critique of Pure Reason,* 1781, revised in 1787. *The Critique of Practical Reason,* 1788, and *The Critique of Judgement,* 1790, complete the system. Other significant works are his *Prolegomena to Any Future Metaphysics,* 1783; *Foundations of the Metaphysics of Ethics,* 1785, and *Metaphysical Foundations of Natural Science,* 1786. In 1755 he published a *Theory of the Heavens* in which he anticipated the nebular hypothesis of La Place. In his essay on *Perpetual Peace,* 1795, he foresaw the necessity for a league of nations.

Kant's philosophy may be thought of as centering around the following three questions: What can I know?, What ought I to do? and For what may I hope? His answer to the first question is that I can know phenomena but not reality; to the second, that I ought to do my duty; and to the third, that I can hope for immortality as a necessary postulate of the moral life. Kant said he had to deny knowledge in order to leave room for faith. He was a great systematizer; in fact his strength in this respect was probably his greatest weakness. In such a schematic mass of machinery as he sets up one is apt to lose the picture of the whole in considering the multitudinous details to which he devotes attention.

In Kant rationalism and empiricism are brought together. Experience is thought of as a joint product of the sensibility on the one hand and the understanding on the other. We have knowledge of phenomena only because the categories of the understanding do not apply to the real world. When reason tries to apply the categories of the understanding to the noumenal world it becomes shipwrecked by its own limitations. Applied to the idea of self it yields only the paralogisms; to the world it lands us in the antinomies, and as for God the historical arguments prove nothing about his existence. By writing an unknowable X across reality Kant left room for faith. In his ethics he shifts ground. Here our knowledge of the supersensible world becomes more certain. The categorical imperative, although purely formal, nevertheless apparently derives its authority from such a world. It gives man certain guidance for practical life.

KAOLIN, a white, opaque to translucent mineral with a strong earthy odor when moistened. Impurities usually color it yellowish, brownish or bluish. Kaolin is plastic and smooth or greasy to the touch, and is the principal constituent of clays. It is a hydrous silicate of aluminium, crystallizing in the MONOCLINIC SYSTEM.

The decomposition of aluminous minerals, particularly FELDSPAR in the granites, gneisses and porphyries, produces kaolin, which may remain in place or be transported and redeposited by running water. It is of widespread occurrence but one of the best localities is Limoges, France, whence comes famous Sèvres porcelain works. Its uses are as for CLAY. The name is derived from the Chinese word meaning "High Ridge," a hill near Jauchau Fu where kaolin has long been mined. *See also* DEPOSITS; GRANITE; GNEISS; SHALE; WEATHERING.

KAPOK, a valuable cotton-like fiber produced on the seeds of the silk-cotton-tree (*Ceiba pentandra*), a large tree of the bombax family native to tropical regions where it is also cultivated. The fiber possesses a peculiar elasticity which renders it especially

valuable for stuffing mattresses, cushions, and similar articles. Kapok is extensively exported from Java.

KARAFUTO. *See* SAKHALIN.

KARAISKAKIS, GEORGES (1782-1827), leader in the War of Greek Independence, was born at Agrapha in 1782. He served under Ali-Pasha in Janina, but left him in 1822 and joined the Greeks. At the first siege of Missolonghi in 1823, he did valiant service toward its relief and in 1826 endeavored to save the town. Being raised to chief of command, he rid the eastern part of central Greece of the Turks, won several victories but before the final triumph of the Greeks was killed in action, May 4, 1827.

KARAITES, a Jewish sect, consisting at the present time of about 15,000 souls, whose religious beliefs and practices follow the strictly literal interpretation of the Hebrew Bible. It was founded in the middle of the 8th century by Anan. During the early period of its existence the sect gained many followers among the Jews in Babylonia, Egypt, Palestine, Persia and Syria, but during the middle of the 10th century it met with strong resistance from Saadia Gaon and his followers. The number of the sect's adherents began to diminish; but in the 11th century it made inroads into the European Jewish communities. The transfer of the field of Karaite activities from Asia to Europe meant the rapid decline of the Karaites in the Oriental lands. Some of them returned to Rabbinic Judaism, others embraced Mohammedanism.

At the beginning of the 12th century they are reported as being found in southern Russia, and at the end of that century the Lithuanian Grand Duke Witold settled some Karaites as colonists in Lithuania. Thence they migrated elsewhere. Karaitic communities flourish to-day in the Crimea, in Constantinople, Cairo, Halicz, Troki and elsewhere. Some Karaites have also found their way to the American continent; but here no organized community is known to exist.

Ever since the sect was founded its leaders and scholars have been engaged in an active literary campaign in defense of its teachings and practices. A rich Karaitic literature has grown up, especially in Arabic and in Hebrew. J. BL.

See Rule, *History of the Karaite Jews,* 1870.

KARA-KALPAK. *See* SOVIET CENTRAL ASIA.

KARAMZIN, NIKOLAI MIKHAILOVICH (1765-1826), Russian historian, poet, and novelist, son of a Russian Tartar officer, was born at St. Petersburg Dec. 1, 1765. His first successful work was *Letters of a Russian Traveler* (1797-1801). His most important work, however, is his *History of the Russian Empire* in 11 volumes (1819-26), which carries Russian history up to 1613. His work is characterized by a tendency to soften the conditions and cruelties set forth in the early annals. Karamzin died at St. Petersburg May 22, 1826.

KARANKAWA, an American Indian linguistic stock, now extinct. The name was applied principally to a small tribe near Matagorda Bay, Tex., but included also affiliated tribes between Galveston Bay and Padre Island. Although the linguistic material extant is meager, the closest relation appears to be with Coahuiltecan. The Karankawa were entirely a coastal people; they traveled by canoe, depended for food on the products of the water, the hunt and the plants of their environment. They practiced head deformation.

KARLFELDT, ERIK AXEL (1864-1931), Swedish poet, was born at Folkarna, in Dalecarlia, July 20, 1864. He was the author of *Songs of the Wilderness and of Love, Fridolin's Songs, Fridolin's Pleasure Garden and Dalecarlian Paintings in Rhyme, Flora and Pomona, Flora and Bellona* and *Horn of Autumn.* Most of his poems deal with his native Dalecarlia. Karlfeldt was secretary of the Swedish Academy. He died at Stockholm, Apr. 8, 1931.

KARLOVY VARY. *See* CARLSBAD.

KARLSBAD. *See* CARLSBAD.

KARLSRUHE, capital of the German state of Baden, situated about 40 mi. northeast of Stuttgart. It owes its existence to Margrave Karl Wilhelm of Baden-Durlach, who established a new residence on the site in 1715. It was around the castle that the town was built. At the beginning of the 19th century many public and private buildings of quiet dignity were erected. There are large concerns making locomotives, stoves, soap and perfumes, as well as art handicraft. Benz constructed the first motorcar at Karlsruhe and it was also there that the first German locomotive was built and the bicycle invented. The castle, with extensive gardens and groves, the art gallery and other collections are noteworthy. The municipal park, the Stadtgarten, is one of the most beautiful in Germany. Pop. 1925, 145,694.

KARMA, a cardinal doctrine of HINDUISM, especially as associated with the doctrine of transmigration. The word means "action" and "the fruit of action." The doctrine means that action works itself into new life—a man inevitably reaps what he sows. *Karma* is thus a doctrine of moral requital. For 2,500 years Hindus have held a belief in "being born again and again," and the passage from birth to birth has been determined by *karma.* The inequalities among men and beings in any life may be explained by *karma.* It is man's part so to avail himself of the process as to nullify and destroy evil action, emphasize good conduct, and obtain, birth by birth, a full release from the *karmic* process, whatever ultimate goal he may be aiming at, according to his notion of religion.

KARMATIANS or **CARMATHIANS,** originally a secret, communistic, revolutionary society organized in 877 in Iraq. For a century they terrorized the region around Baghdad and Syria, storming both Basrah and Kufah, and even desecrating Mecca. They carried off the black stone of the Ka'ba and kept it 20 years. The term Karmatian applies, however, not merely to this society, but to a wide-spreading movement throughout the Moslem world from the 9th to the 12th century. ISMAILIANS, Karmatians and Fatimids, all Shiite reactionaries, disputed by secret propaganda and the use of arms the reign of

the Abbasid Caliphs, 750-1258. In general, when not merely political nihilists, they based their movement upon the claims of the family of Ali, husband of Fatima, as supreme by divine right in the House of Islam. Ultimately they succeeded in establishing the Fatimid dynasty, 908-1187, in Egypt. The Karmatians formulated a comprehensive and highly intricate system of theology with reference to the divine essence as sole reality, true worship as insight, and true knowledge as illumination. In contrast with orthodox Islam it was very heretical indeed, both in religion and in politics.

KARNAK, a village in Upper Egypt, comprising with LUXOR the ancient city of THEBES, and situated on the right bank of the Nile, about 450 mi. above Cairo. The Karnak ruins, extending over a distance of about 1 mi., are among the most magnificent in the world. They include three brick enclosures of unequal size, the largest forming a square measuring 1,500 ft. along each side. The largest enclosure contains the Temple of Amen, a gigantic edifice begun probably in the 12th dynasty (3600-3400 B.C.); its chief development dates from the 18th to the 20th dynasties (1587-1102 B.C.), and the rulers responsible for its principal glories were Amenhotep I, Thotmes I, Queen Hatshepsu, Thotmes III and Ramses I. Also in this enclosure is the awe-inspiring Hall of Columns, built in the 19th dynasty by Seti I and Ramses II; it measures 330 ft. by 170 ft., and is 78 ft. high; its 134 columns, 70 ft. high, are arranged in 16 rows; reliefs and inscriptions, commemorating Egyptian triumphs, adorn the walls and columns. The two smaller enclosures contain respectively a temple of Mentu and a temple of Mut, both erected by Amenhotep III. Behind the ruins is a sacred lake, horseshoe-shaped. The clearance and restoration of Karnak, begun late in the 19th century, have been largely a French enterprise.

KAROK, the name by which are known the American Indians of the Quoratean stock, which has been consolidated with other linguistic stocks into HOKAN. They lived on the Klamath River in California between the Yurok and Shasta. In culture they resemble most closely the Yurok and Athapascan Hupa. They were divided into three groups of villages, each group having certain specialized ceremonies.

KAROLYI, MICHAEL, COUNT (1875-), Hungarian political leader, born Mar. 4, 1875. He strove for the creation of an Agrarian Center Party but finally changed to the radical wing of the Independence Party, opposing Count Tisza. His policy led to secret negotiations with France and the organization, Oct. 25, 1918, of the National Council. He was appointed prime minister in the name of King Charles and remained in this office until Jan. 1919, when he was proclaimed president of the People's Republic. Shortly afterwards he was driven out by the Communist movement under BELA KUN.

KARPATHOS, or Scarpanto, an island in the Carpathian Sea, about 50 mi. northeast of Crete. Its of 109 sq. mi. is almost completely mountainous with little vegetation. During the Middle Ages it was under the rule of Venice and then of Turkey. In 1912 the island fell to Italy. Est. pop. 1931, 11,500.

KARTEL. *See* CARTEL.

KASAAN, a Haida Indian town with a negligible population, situated on Kasaan Bay, on the east coast of Prince of Wales Island, Alaska. The Masset dialect of the Haida linguistic stock is spoken here.

KASBIN. *See* KAZVIN.

KASCHAU. *See* KOŠICE.

KASHAN, a town of Persia and capital of the province Kashan, located amid the mountains on the caravan route between Isfahan and Tehran. A college is situated here. There is a considerable trade in rose water, copper works, silks and woolens. The faience tile known as kashi used for the ornamentation of buildings about a century ago was once made here and an effort to revive this industry has failed. Likewise the extensive trade in velvets and brocades for which the town was noted has been greatly affected by the influx of machine made goods. Kashan is noted for the figs and melons which are grown in the environs. Est. pop. 1930, 15,000.

KASHGAR, a city of Chinese Turkestan, the military center of the province of Sinkiang, situated on a branch of the Tarim River, 100 mi. northwest of Yarkand. Its position in the center of an oasis makes it the focus for several great routes to Russia, Peking and India, there being no railroad. The oasis was part of an independent kingdom until conquered by the Chinese about the middle of the 18th century, and with short interruption it has remained in their power. There are considerable manufactures of textiles, leather and pottery. Fruits, grains, cotton and rice are grown here. Est. pop. 80,000.

KASHMIR, also **CASHMERE,** a native state of northern British India, embracing the provinces of Kashmir itself, Jammu and a number of frontier districts. The total area of Kashmir is 84,230 sq. mi. The state is a mass of mountain peaks rising from 10,000 to 26,000 ft. above the sea. Numerous rivers, among them the INDUS and Shayok, water the region. There are many valleys, of which the most renowned is the Valley of Kashmir, lying about 600 ft. above sea level and traversed by the River Jehlam. It is a legend among the natives that, viewed from a mountain peak, this winding river suggested the pattern for the Kashmir shawls. Formerly, the weaving of these woolen shawls was the principal industry of the region but it has been replaced by silk weaving. The valley is also noted for its fertility, producing rice, which is the staple food of the natives, maize, oats, barley, wheat and a large variety of fruits and vegetables. Carpets, wood-carvings, silver-works, saddlery and attar of roses are important articles of manufacture.

Kashmir was incorporated in the Mogul empire in 1581. In 1756 the Afghans conquered the region, which came under British domination in 1846. The state is governed by a maharajah, who resides at Srinagar, in the Vale of Kashmir. A Resident repre-

sents the British Government of India. Mohammedans comprise the majority of the inhabitants. Pop. 1921, 3,330,518; 1931, 3,645,339.

KASHUBIAN, a Lechic language of the west SLAVIC linguistic group spoken in those parts of former West Prussia, near Dantzig, which have belonged to Poland since 1920. The number of speakers is about 100,000, but they are rapidly becoming Polonized, especially as there is no Kashubian literary language. While closely related to POLISH, Kashubian is a distinct tongue, although the boundary between it and Polish dialects is difficult to determine. Its westernmost dialect is SLOVINCIAN, and it is also closely akin to POLABIAN. A. SE.

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KASKASKIA RIVER, a river of southwestern Illinois, rising in Champaign Co. It flows generally southwest through level and open agricultural lands and after a course of about 320 mi. enters the Mississippi in Randolph Co. The area drained is estimated at 5,840 sq. mi. The Kaskaskia is navigable for about 90 mi. or to Vandalia. Shoal Creek flows into it from the north and the towns of Shelbyville and Vandalia are on its course.

KATAHDIN, MOUNT, the highest peak in Maine, situated at approximately the center of the state in Piscataquis Co. The surrounding country is an almost uninhabited region of forests and lakes. The mountain is a rugged, bulky mass of granite rising abruptly from the general level of a few hundred feet to 5,273 ft. above the sea. It has four summits of which the highest are the two toward the south: West Peak, 5,273 ft., and East Peak, 5,260 ft. The several sharp spurs projecting from the main mass were carved by glaciers which also left large expanses of barren rock on the slopes.

KATA THERMOMETER, an instrument resembling an ordinary THERMOMETER but with a much larger bulb; used to determine the cooling effect of the atmosphere in any given space. The instrument is heated above 100° F. and then suspended in the atmosphere whose cooling power is desired. The time required for a change in reading from 100° to 95° F. is taken as a measure of the cooling power of the air.

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KATER, HENRY (1777-1835), English physicist, was born at Bristol, Apr. 16, 1777. After spending 20 years in the army he retired in 1814 to conduct scientific research. He determined the length of a second's pendulum and invented the floating collimator, employed in astronomy. He died at London, Apr. 26, 1835.

KATMAI NATIONAL MONUMENT, situated near the base of the Alaskan Peninsula in southern Alaska, was created by presidential proclamation Sept. 24, 1918 and reduced by 10 acres to its present area of 1,087,990 acres Sept. 5, 1923. Mt. Katmai, from which the monument takes its name, is a tremendous volcano whose last eruption occurred in 1921. Several cubic miles of material were emitted during this explosion leaving a crater 8.4 mi. in circumference. The volcano is now quiet and the crater contains a lake over 1 mi. long and almost 1 mi. wide.

The most spectacular feature of the monument is the famous Valley of Ten Thousand Smokes in the northwestern section. This was first discovered in 1916 and was explored in 1917 by the National Geographic Society. A portion of this valley, 15 mi. long and in some places 9 mi. wide, presents a fantastic volcanic phenomenon. Several million steam jets shoot into the air, occasionally to a height of 1,000 ft., through vents or openings known as fumaroles. The steam from these little volcanoes merges into a thick cloud ceiling above the valley. Around the openings are mineral deposits of every conceivable tint of the rainbow. Explorers cooked their food over the nearest hot vent; they frequently found the ground much too hot to walk on and their naturally steam heated tents far too warm for comfort. The scenery of the surrounding region is magnificent. Fish and waterfowl are abundant in the mountain lakes and the Alaskan brown bears, among the largest carnivorous animals extant, are found in large numbers in the mountain forests.

Until a proposed 30 mi. highway into the monument becomes an accomplished fact, the region is inaccessible to all save experienced mountain climbers and explorers.

KATO, TAKA-AKIRA, VISCOUNT (1860-1926), Japanese statesman, was born at Nagoya, Jan. 3, 1860. For five years following 1894 and again for four years after 1912 he was Ambassador at London. Later as Minister for Foreign Affairs he counseled a strong policy toward China, attempting to press the Twenty-one Demands to the utmost. He entered the House of Peers in 1915 and in 1924 became Premier. During his tenure of this office his cabinet established universal manhood suffrage in Japan. He died Jan. 27, 1926.

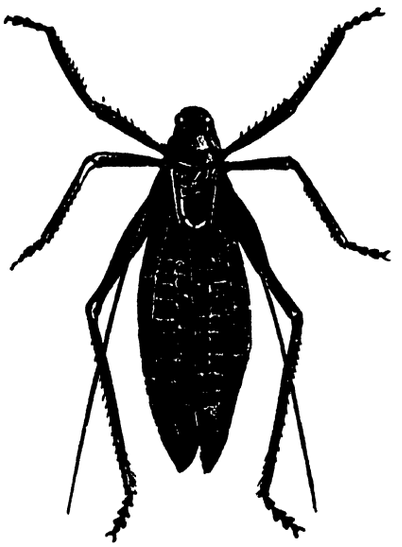
KATONA, JOSZEF (1792-1830), Hungarian poet and dramatist, was born at Kecskemet, Nov. 11, 1792. His *Bank Ban,* produced in 1821, is considered one of the greatest of Hungarian tragedies. Katona was comparatively unknown until 1845, and this failure to be recognized embittered his life and caused him to give up writing poetry. He died at Kecskemet, Nov. 2, 1830.

KATOWICE or **KATTOWITZ,** the capital of the Polish voievodship of Silesia, 40 mi. west of Cracow and the residence of the Bishop. Since the incorporation of six nearby towns it has been an important center of the Upper Silesian industrial region, intersected by many railroad tracks. In the beginning of the 19th century Katowice was only a small village consisting of several thatched cottages; in the year 1832 it had only 750 inhabitants. Not until the second half of the 19th century did Katowice begin to develop; it gradually became an industrial town

and the center of coal industry in Upper Silesia. The town possesses two Neo-Gothic Catholic churches, a Neo-Roman Evangelican church, the tower of which was designed by Frederick Wilhelm IV, King of Prussia, an old Catholic church and a synagogue built in Moorish style. As an important mining center, the city has hard coal mines, zinc works, rolling mills, steel foundries, factories making metal and cement works, explosives, and machinery of various sorts. The trade is in iron, coal, lumber and grain. Est. pop. 1930, 128,270.

KATSURA TARO, PRINCE (1847-1913), Japanese statesman and military commander, was born as a commoner at Hagi, Choshu, and entered the military service as a boy. He studied army methods in Germany in 1870 and in 1884 and two years later became Vice-Minister of War. He served in the Sino-Japanese War and became Premier in 1901. During the four years that he held this office he succeeded in securing the alliance with Great Britain and guided his country through the Russo-Japanese War. From 1908 to 1911 he again acted as Premier and held this office for a few months in 1912, resigning on a vote of censure of the diet directed against fiscal irregularities of members of his cabinet. He died at Tokyo, Oct. 10, 1913.

KATYDID, a tree-dwelling insect (*Pterophylla camellifolia*) belonging to the family of long-horned grasshoppers and allied to the crickets. The Katydid



TRUE KATYDID

has large leaflike wing covers which it rubs together, producing its well known strident notes. Various closely related species are also known as Katydids.

KAUFFMANN, ANGELICA (1741-1807), Swiss portrait painter, was born at Coire, in the Grisons, Oct. 30, 1741, the daughter of a mediocre artist. At 18 she became the friend of Winckelmann and a little later went to England where she achieved success both socially and professionally. She was patronized by the court and sought in marriage by Sir Joshua Reynolds, whom she refused in favor of an adventurer named Horn. This unfortunate alliance was followed in 1781 by marriage with Antonio Zucchi, an Italian artist, with whom she went to Rome, there becoming the friend of Goethe and Herder. Her pictures are known through the engravings by Bartolozzi and are found in most important European galleries. She executed historical paintings for Russian rulers and other European royalty, but was more successful in her less pretentious portrait pieces. Kauffmann died at Rome, Nov. 5, 1807.

KAUKAUNA, a city in Outagamie Co., eastern Wisconsin, situated on the Fox River, 7 mi. northeast of Appleton. It is served by river craft and the Chicago and Northwestern Railroad. The chief interests of Kaukauna are agricultural, but there are machine shops and paper is manufactured. Kaukauna received a charter in 1885. Pop. 1920, 5,951; 1930, 6,581.

KAUNAS (KOVNO), a city of Lithuania, situated on the right bank of the Nemunas, 60 mi. from Vilna. Since the annexation by Poland of the latter city, which is regarded by the Lithuanians as their traditional capital, the seat of the Lithuanian government has been at Kaunas. A large amount of money has been expended toward the improvement and modernization of Kaunas. New buildings and municipal electric power houses have been erected. Industrial enterprises are rapidly developing, the metal industry having considerable importance.

A fortified city under the Russians, Kaunas nevertheless fell an easy prey to the Germans during the World War and many of the buildings were razed to the ground. Pop. 1931, 98,330.

KAUNITZ, WENZEL ANTON, Count of Reitberg (1711-94), Austrian statesman, was born in Vienna, Feb. 2, 1711. He was educated for government service. Relatively a young man at the accession of MARIA THERESA, he rose rapidly in her favor, undertaking several important diplomatic missions before his excellent work at the Congress of Aix-la-Chapelle, in 1748, won for him an international reputation as a diplomat. During the peace between the war of the Austrian Succession and the Seven Years' War, he brought about a complete change in the system of European alliances which is sometimes spoken of as the Diplomatic Revolution. From being the traditional enemy of Austria, France was won over as an ally, committed to aid Austria in a war to win back Silesia from FREDERICK THE GREAT. He was appointed chancellor in 1753, and for the remainder of his life—a period of 40 years—he remained the principal adviser, first of Maria Theresa, and later of Joseph II. A moderate conservative, sincere and upright, he was also patron of the arts. He retired from public life upon the accession of Francis II, and died on June 27, 1794.

KAURI PINE (*Agathis australis*), an evergreen coniferous tree of the pine family, known also as cowrie, closely allied to the araucarias. It is a native of Australia and New Zealand, sparingly cultivated in California. The tree grows 120 to 150 ft. high bearing

short narrow leaves and globular cones, 2 or 3 in. in diameter. It yields kauri gum, called also dammar and Australian copal, used in making varnishes.

KAVALLA, a picturesque seaport on the bay of the same name in Greek Macedonia. The city is built on a long peninsula which extends into the bay with harbor facilities on both sides. Kavalla is the point of export for the excellent Macedonian tobacco which grows in the region, but the railroad from Salonika to Constantinople is 22 mi. to the north with no branch line connecting the port. Until 1912 the city was a Turkish possession but in that year it was annexed by Greece after much opposition by the Bulgarians, who desired a seaport on the Aegean. In the district are many Roman ruins, among them an aqueduct which still supplies the city with water from Mt. Pangeon. Pop. 1928, 49,980.

KAWAIISU, a Californian Indian tribe, a subgroup of the Ute-Chemehuevi division of the Shoshonean linguistic stock. The Kawaiisu occupy both sides of the Tehachapi Mountains in California. Culturally they were like their California neighbors.

KAYAK or **KAIAK,** a type of hunting boat used exclusively by men among the Eastern and Western Eskimo. The boat is constructed of a framework of whale ribs or driftwood over which is drawn a covering of sealskin or caribou skin, the latter being used particularly in Alaska. Each fall the skin cover is removed and otherwise utilized while the framework is saved and re-covered for use the following spring. Except for a round hatch-like opening in the center, the boat is entirely enclosed. It is propelled by a single or double paddle, though the former is more usual. An interesting feature of this type of vessel is that it is possible for the boatman sitting in the small hatch to lash his waterproof skin coat to the gunwales and so shut himself in that though he may capsize the boat it will draw no water. *See also* Boat.

KAYE-SMITH, SHEILA (1888-), English novelist, was born at St. Leonard's near Hastings, Sussex, in 1888. She was privately educated, and has always lived in Sussex, making it the scene of much of her fiction. She began writing when quite young, publishing her first novel, *Tramping Methodist,* when she was 20. Her books include *Sussex Gorse,* 1916, *Green Apple Harvest,* 1920, *Joanna Godden,* 1921, *Joanna Godden Married,* a collection of short stories, 1926, *Iron and Smoke,* 1928, *The Village Doctor,* 1929, *Shepherds in Sackcloth,* 1930, and *Susan Spray,*

KAYSERI, also **KAISARIA,** a city of Asiatic Turkey, situated near Mt. Argaeus, about 160 mi. southeast of Angora. Parts of a wall inclose the city, its large bazaars, narrow, winding streets and a mosque built in the early 13th century. Caesaria, the residence of the Cappadocian kings, is believed to have been the original city here. Used as a fortress in the time of Justinian, Kayseri was captured by the Seljuk Turks in 1064 and by the Mongols in 1243. Soon afterward it passed into the hands of the Osmanli Turks. At present Kayseri is the headquarters of the American mission in Cappadocia. Fruit, raisins, hides and carpets are the chief articles of export. Pop. 1927,

KAZAN, the capital city and river port of the Tatar Autonomous Republic, R.S.F.S.R., in east central European Russia. It is the leading cultural center of the Volga region, situated near the Volga River where the Kama River enters. Kazan is an important industrial and trading community, and has adequate railroad facilities. The population is predominantly Russian, though Tatars constitute a considerable minority. Founded by the Tatars in the 13th century, Kazan became the seat of Mohammedan thought. Captured by the Russian, Ivan the Terrible, in 1552, it then became a base for the suppression of peasant uprisings. Later its culture dominated all eastern Russia. In 1800 at Kazan appeared the first Russian provincial newspaper. Czechoslovaks, Reds and Whites fought for possession of the city after the 1917 Revolution. Many structures damaged during these disturbances have since been restored. It is the seat of the Central Museum of the Tatar Republic, the State University, where Tolstoy and Lenin received their educations, the Tatar Communist University, the Eastern Pedagogical Institute, an agricultural and forestry institute, libraries, numerous schools, a Tatar printing-press, a medieval cathedral and several monasteries. Important factories are textile mills and the leather works for which Kazan has long been famous. In a suburb is a dynamite factory founded in 1787, and other leading manufactures are toilet articles and soaps. The ancient walled Kremlin contains the imposing Sumbek Tower. Mosques and Greek orthodox churches are evidences of intermingled Slav and Mongol influence. Pop. 1926, 179,023.

KAZANLUK, a town of Bulgaria, situated at the foot of the Balkan Mountains and at the eastern end of the famous Valley of Roses. In the spring during late May or early June the rose-growers drive carts loaded with rose petals to the town to sell to the distillers of attar of roses, the rare perfume for which Bulgaria is well known. Kazanlik with Kalofer and Karlovo farther up the valley are the three distilling centers of the perfume. The government experimental station for rose culture is located at Kazanlik and an aviation school has recently been opened. *See also* Bulgaria: *Production and Industry.* The district is rich in vegetables and fruit and is the market town for a large territory. Pop. 1931, 12,250.

KAZVIN or **QUAZVIN** or **KASBIN,** a city of Persia and capital of the province of Kazvin, situated on the southern incline of the Elburz Mountains about 100 mi. from Tehran. The city is an important junction of caravan routes leading to Tehran, Resht, Tabriz and other cities. In the 16th century Kazvin was the capital of Persia and ruins of the early palaces exist today. The walls which once enclosed the city are now in bad condition owing to repeated earthquakes. Velvets, silks and cottons are

made extensively in Kazvin, which also ships out fish, rice and raisins. Est. pop. 1930, 30,000.

KEAN, CHARLES J. (1811-68), English actor, was born at Waterford, Ireland, Jan. 18, 1811. He first appeared, as Young Norval, on Oct. 1, 1827, and then acted with the elder Kean till 1833. Besides having physical defects, he suffered at first from comparisons with his father, EDMUND KEAN, but he gradually acquired a reputation in the provinces, in Ireland and America, and made his first London success in *The Iron Chest,* as Sir Edward Mortimer. He introduced the higher French melodramas, of which *Pauline* is an example, and to which he was best suited. He gave his Shakespearean revivals at the Princess and presented elaborate pageantry which went beyond his predecessors in historical correctness and the stage management of groups. His wife was Ellen Tree (1805-80), a well-known actress. Kean died at London, England, Jan. 22, 1868.

KEAN, EDMUND (1787-1833), English actor, was born at London, Nov. 4, 1787. His mother was Ann Carey, an actress. At four years he made his first appearance in a ballet, as Cupid. He ran away from school to sea, but soon tired of the life. While undergoing the vicissitudes of a roving player he began to attract notice. At length the committee of the declining Drury Lane Theatre engaged him as a desperate "experiment." On Jan. 26, 1814, he appeared as Shylock in *The Merchant of Venice.* Famous overnight, he then played *Hamlet, Othello, Macbeth* and *Lear.* Hazlitt and Coleridge wrote his praises. He visited America in 1820 and 1825. But Kean could not stand success. His eccentricities and immoralities increased, and on his divorce suit the public took sides against him. When he visited New York and Boston in 1825 he was catcalled, hissed and pelted with rotten apples. He returned to England broken in health and retired from the stage. On Mar. 25, 1833, while playing Othello to his son's Iago, at Covent Garden, he sank to the floor after the line, "Othello's occupation's gone," and was carried exhausted from the stage. He died at Richmond, May 15, 1833.

KEANE, JOHN JOSEPH (1839-1918), American Catholic prelate, was born at Ballyshannon, County Donegal, Ireland, Sept. 12, 1839. He came to the United States at an early age and, after being educated at St. Charles's College and St. Mary's Seminary, Baltimore, was ordained in 1866, becoming assistant at St. Patrick's, Washington, D.C. In 1878 he was made bishop of Richmond, Va., and was active in organizing Catholic societies throughout the country. From 1886 to 1897 he was rector of the Catholic University of America. In 1897 Keane was created titular archbishop of Damascus and for three years served in Rome as canon of St. John Lateran and bishop-assistant at the pontificial throne. He returned to America, being transferred to the see of Dubuque, Ia. Keane resigned in 1911, with the titular appointment of archbishop of Ciana. A well-known book of his is *Onward and Upward,* 1902. He died at Dubuque, June 22, 1918.

KEARNEY, a city in south central Nebraska, the county seat of Buffalo Co., situated near the Platte River, about 150 mi. west of Lincoln. It is served by bus lines and two railroads. There is an airport. Kearney is a shipping point for grain, and manufactures flour, feed, playground equipment and various other products. Ft. Kearney was built near the present city in 1848. Dobey Town, later abandoned, grew up around it. Kearney was settled about 1871. Ft. Kearney State Park preserves the old fort. Kearney was incorporated in 1873. It is the seat of the State Teachers College. Pop. 1920, 7,702; 1930, 8,575.

KEARNEYISM, an agitation in California, 1877-80, led by Dennis Kearney, Irish Laborer, directed against the Chinese in the state, and hostile to the conservative, moneyed classes. Kearney was organizer and president of the Workingman's Party of California, the political manifestation of the hostility of unskilled white labor to Chinese competition. Mass meetings in the sand lots of San Francisco, rowdyism and mob violence, and extravagant denunciation of the Chinese, the "blood-sucking capitalists" and the leaders of the major parties in California, characterized the movement. In 1879 Kearney's adherents forced the adoption of a new state constitution embodying many radical features, and controlled state politics. Kearneyism survived after the downfall of the Workingman's Party as a racial prejudice against all Orientals.

KEARNY, a rapidly growing industrial town of Hudson Co., N.J., located between the Hackensack and Passaic rivers, and separated by them from Newark and Jersey City respectively. It occupies a level site with extensive docking facilities. Part of its area consists of marshland, a large portion of which has been reclaimed for industrial sites. Manhattan Transfer, an important junction point in the system of railway tubes under the Hudson River, is located here. The Lincoln Highway, elevated at this point, traverses a section of the town. It is served by the Pennsylvania, Central of New Jersey, Erie and Lackawanna railroads, electric rapid transit and trolleys, and motor bus lines. Its industrial establishments, the varied manufactures of which were valued approximately at $187,000,000 in 1929, include railroad shops, shipbuilding works, and plants producing electric power, paints, meats, building materials and electrical utilities and equipment. The retail trade in 1929 amounted to $8,496,538. It was separated as a township from Harrison in 1867 and incorporated as a town in 1895. Pop. 1920, 26,724; 1930, 40,716.

KEATS, JOHN (1795-1821), English poet, was born in London, probably Oct. 31, 1795, the son of a livery stable keeper. He was orphaned at an early age, and executors wasted his modest legacy. He attended a school kept by Rev. John Clarke, and for a time worked as a surgeon's apprentice. The first really significant event in the poet's life was probably his reading of Spenser's FAERIE QUEENE. In 1814 Keats returned to London, and there came under the

influence of LEIGH HUNT and the anti-classicists. With Charles Brown he made a walking tour in 1818 through northern England, Scotland and Ireland. The story of his violent passion for Fanny Brawne, which developed after his return to London, has been often told. In 1820 the poet suffered the first attack of consumption, which was to kill him at the age of 25, and in that year he left England. He arrived in Rome a dying man and was cared for by Joseph Severn. Keats died in Rome, Feb. 23, 1821, and was buried there in the Protestant Cemetery.

In 1817 *Poems by John Keats* appeared, containing the famous sonnet, "On First Looking Into Chapman's Homer"; it was followed in 1818 by *Endymion*. Both volumes, particularly the latter, were harshly criticized for their lack of discipline, their over-richness. But between 1818 and the year of his death Keats went through a period of self-discipline which was to make him, possibly of all English poets, the one of greatest spiritual and technical wholeness. In 1820 he published a volume bearing the mature, ripe fruits of his genius, notably "Hyperion," "The Eve of St. Agnes," LA BELLE DAME SANS MERCI and the great odes, "To a Nightingale," "To Psyche," "On a Grecian Urn," and "Ode to Autumn." Among his other works are *Lamia,* two poetic dramas, *Otho the Great* and *Stephen,* and some sparkling light verse. Of all Keats's remarkable qualities perhaps the most characteristic is the richness, the sense of rounded abundance which fills his images and is found in so many of his "magic" lines. He had imagination, delicacy, a fine sensuousness, and, as Matthew Arnold says, "he had character." *See also* ENGLISH LITERATURE.

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KEBLE, JOHN (1792-1866), English churchman and poet, was born at Fairford, Gloucestershire, Apr. 25, 1792. He was graduated from Oxford and was ordained in 1816. His *Christian Year,* published 1827, is a collection of poems for Sundays and church days, and passed through 158 editions in 45 years. Keble was a leader in the Tractarian Movement and always worked for the maintenance of High Church principles. After succeeding Milman as professor of poetry at Oxford he became vicar of Hursley in 1835, remaining there until his death. His *Lyra Innocentium* appeared in 1846. He died at Bournemouth, Mar. 29, 1866.

KECSKEMET, a municipal borough in the Hungarian county of Pest, about 64 mi. southeast of Budapest by rail. It is surrounded by a rich fruit-growing region. Several churches and two abbeys are located here; among the imposing secular buildings are the city hall, a museum, a law academy and a barracks. The cultivation of tobacco and the raising of cattle and fowl are important. Large cattle fairs are held at Kecskemet. Pop. 1930, 79,505.

KEDAH, one of the unfederated Malay States under British suzerainty, lying on the west coast of the MALAY PENINSULA and comprising an area of 3,648 sq. mi. Rice is the principal product, but rubber, coconuts and tapioca are also produced. Pengang is the chief port, and Alor Star, situated on the Kedah River 70 mi. from the sea, is the capital. In 1921 Kedah had a population of 338,554 of which the majority was Malay and the rest Chinese and Indian.

KEELING ISLANDS, Indian Ocean. *See* COCOS ISLANDS.

KEEN, WILLIAM WILLIAMS (1837-1932), American surgeon, born in Philadelphia, Pa., on January 19, 1837. He graduated at Brown University (A.M.) in 1859, and Jefferson Medical College, (M.D.), in 1862. Keen was the author of an important work on the surgical complications and sequels of typhoid fever (1898), and was noted as a brilliant and skillful operator, particularly in diseases of the brain. He is best known by his *American Textbook of Surgery* (1892, 1903) and his *System of Surgery* (1905-1921), which are probably the leading American contributions of their kind. Among his historical essays, his *Early History of Practical Anatomy* (1870) is most valuable for its accuracy and thoroughness. Dr. Keen was a staunch defender of animal experimentation, and a philosophical writer on many medical and general subjects. His historical article describing his operations on President Grover Cleveland attracted world-wide notice. His achievements won him election to every high office in American medicine and surgery. He died June 7, 1932.

KEENE, LAURA (1820-73), English actress-manager who spent most of her life in America, was born in London, 1820. She began her career in England and played Pauline in *The Lady of Lyons* in London, 1851, with great success. She first came to America the following year, and later opened the Laura Keene Theatre in New York City. She toured America many seasons, notably with *Our American Cousin,* during a presentation of which in Washington, D.C., President Lincoln was assassinated, 1865. She died at Montclair, N.J., Nov. 4, 1873.

KEENE, a city in southwestern New Hampshire, the county seat of Cheshire Co., situated 50 mi. southwest of Concord. It is served by the Boston and Maine Railroad. There is an airport. The region is good farming land, and has also mica and feldspar deposits. Keene is an industrial center. Among its numerous manufactures are shoes, woolens, celluloid articles, boxes, chairs, toys, portable houses and silver polish. In 1929 the factory output amounted approximately to $11,000,000; the retail trade reached a total of $8,881,030. The city is the seat of a State Normal School, and the scene of an annual winter sports carnival. The site was settled about 1773. Keene was chartered in 1874. Pop. 1920, 11,210; 1930, 13,794.

KEENE'S CEMENT. *See* GYPSUM PLASTER.

KEGS. *See* COOPERAGE.

KEIGHLEY, a municipal borough in the West Riding of Yorkshire, England, situated about 202 mi.

northwest of London. It is in a deep valley at the confluence of the Worth and Aire rivers, and the last outpost of an industrial area beyond which runs exceptionally unspoiled countryside. A canal connects Keighley with Liverpool and Leeds. The much restored parish Church of St. Andrews dates from the 12th century, and among educational foundations are an 18th century grammar school and a modern Mechanics' Institute. The industries of Keighley include spinning and the manufacture of sewing and washing machines, woolens and tools. Pop. 1921, 41,921; 1931, 40,440.

KEIJO-FU. *See* SEOUL.

KEITH, SIR ARTHUR (1866-), British anthropologist, was born at Old Machar, Aberdeen, Feb. 5, 1866. He was educated at Aberdeen, London and Leipzig, becoming a prominent anthropologist and authority on fossil remains and prehistoric man. During 1917-29 he served the Royal Institution as professor, secretary and treasurer. He was knighted in 1921, and was elected president of the British Association in 1927. His publications include *Human Embryology and Morphology, Antiquity of Man* and *Concerning Man's Origin.*

KEKULE VON STRADOVITZ, FRIEDRICH AUGUST (1829-96), German chemist, was born at Darmstadt, Sept. 7, 1829. In 1858 he became professor at Ghent and in 1865 at Bonn. He worked upon the chemical structure of the hydro-carbons and his valency theory, published in 1865, is the basis of the modern view of the building up of chemical compounds. In 1885 he was elected a member of the Prussian Academy of Sciences. He died at Bonn, July 13, 1896.

KELANTAN, a Malay state under British suzerainty, lying on the east coast of the Malay Peninsula and embracing an area of 5,713 sq. mi. Kota Baharu, situated 6 mi. from the sea, is the only town and is the administrative center of the state, which is largely covered by jungle. Lumber, rattans and bamboos are found in abundance, and maize, pepper, sugar cane and tapioca are exported. Pop. 1921, 309,300.

KELLER, GOTTFRIED (1819-90), German-Swiss novelist, was born at Zürich, July 19, 1819. He vacillated between painting and writing during his studies at Munich, Heidelberg and Berlin. In 1855 he published his first novel, presumably an autobiography in four volumes, *Der grüne Heinrich,* and in 1856 the short stories *Die Leute von Sedwyla.* For many years he was Cantonal Secretary at Zürich, where he wrote *Sieben Legenden,* 1872, *Züricher Novellen,* 1878, and *Martin Salander,* 1878. This patriotic Swiss Republican, who overflows with gaiety and humor, is recognized as one of the leading German novelists. Keller died at Zürich, July 16, 1890.

KELLER, HELEN ADAMS (1880-), American writer and lecturer, was born at Tuscumbia, Ala., June 27, 1880. She lost her sight, hearing and speech at the age of 19 months as a result of a severe illness. In 1887 Dr. Alexander Graham Bell, who was interested in the education of the deaf, sent Miss Anne Mansfield Sullivan (Mrs. John A. Macy) of the Perkins Institute for the Blind to her home to teach her the deaf and dumb language by touch and the Braille system of reading. When 14 years old, she went to the Wright-Humason Oral School in New York and studied speech and lip reading for two years. Then she went to a preparatory school and entered Radcliffe College in 1900, finishing her course in the regular four years. Throughout her preparatory and college work, Miss Sullivan, who was her constant companion from 1887, accompanied her to her classes, took notes on the lectures, read the required books and spelled them into the hand of Miss Keller. Only a few of her textbooks were printed in Braille.

Following her graduation she was a member on advisory boards for societies for the blind and deaf. She has lectured all over the country on the opportunities for education of the deaf and blind and on her personal experiences and written both magazine articles and books. Among her books are *The Story of My Life,* 1902; *The World I Live In,* 1908; *My Religion,* 1927; and *Midstream: My Later Life,* 1929.

M. R.

KELLEY, ROBERT MICHAEL (1877-), American educator and clergyman, was born in Manson, Ia., July 24, 1877. He was graduated from St. Louis University, 1903 and 1904; studied theology there, 1908-12; and was ordained a Roman Catholic priest. He taught at the University of Detroit, 1904-08, and served on the faculty of Creighton University, Neb., 1913-20. He presided over Regis College, Denver, 1920-26; was assistant to the provincial of Missouri Province Society of Jesus, 1926-27; and became president of Loyola University, Chicago, in 1927.

KELLOGG, FRANK BILLINGS (1856-), American public official, was born at Potsdam, N.Y., Dec. 22, 1856, moving to Minnesota as a child. He was admitted to the bar in 1877 and during the administration of President Roosevelt was retained as special counsel for the government in cases against the Standard Oil Co., the paper trust and the Union Pacific-Southern Pacific railroad merger. He was President of the America Bar Association in 1912-13. In 1917 he was elected to the United States Senate and in 1924 was appointed by President Coolidge Ambassador to Great Britain. In 1925 he became Secretary of State, and in this office secured international adherence to the Kellogg-Briand Pact, or Pact of Paris, for the renunciation of war as a national policy, which was signed by 15 nations in Paris, Aug. 27, 1928. In recognition of this, Mr. Kellogg was awarded the Nobel Peace Prize in 1929. In 1930 he was elected a judge of the Permanent Court of International Justice at The Hague.

KELLOGG, VERNON LYMAN (1867-), American zoölogist and writer on scientific subjects, was born in Emporia, Kan., Dec. 1, 1867. From 1890 to 1894 he was assistant and associate professor of entomology at the University of Kansas. In 1894 he became professor of entomology at Leland Stan-

ford Jr. University, and from 1915 to 1921 he acted in various capacities for the U.S. Food Administration. In 1919 he became chairman and permanent secretary of the division of educational relations of the National Research Council. He wrote numerous text books, works popularizing scientific matters, and works on general subjects including *Herbert Hoover, the Man and his Work, Mind and Heredity, Reading with a Purpose—Biology* and *Evolution.*

KELLY, FREDERICK JAMES (1880-), American educator, was born at Wymore, Neb., Sept. 7, 1880. He graduated from the University of Nebraska in 1902, and took his Ph.D. at Teachers' College, Columbia, in 1914. Kelly taught in public and normal schools until 1915, when he became dean of the School of Education, University of Kansas. From 1923-28 he was dean of administration at Minnesota, and in 1928 became president of the University of Idaho. In 1931 he undertook special studies in higher education in the United States office of Education, Washington, D.C.

KELLY, HOWARD A. (1858-), American gynecologist, born in Camden, N.J., February 20, 1858. He graduated in medicine from the University of Pennsylvania in 1882, and, following an internship in the Episcopal Hospital, founded the Kensington Hospital for Women in Philadelphia. In 1888, he devised the open cystoscope by which a light is introduced into the interior of the body to aid in diagnosis and operations. He has served as associate professor in obstetrics and gynecology at the University of Pennsylvania, 1888-1889, and since 1889 has been connected with Johns Hopkins University, holding the same professorship, 1889-1899, and of gynecology, 1899-1919. Since 1919 he has been consulting gynecology and emeritus professor at Johns Hopkins. He was a pioneer in the use of radium in cancer and in the use of cocaine anesthesia, and is the inventor of the Kelly pad. His *Operative Gynecology* (1898, 1906) and *Medical Gynecology* (1908, 1912) are among the leading American treatises of the time. Kelly is also known by his valuable historical contributions on hypnotism, American gynecology, appendicitis, vesicovaginal fistula, medical botanists, medical illustration, and American medical biography.

M. F.

KELP, the name given to various large brown-seaweeds, especially species of *Fucus* and *Laminaria,* which grow in great abundance along northern coasts. The commercial product known as kelp, formerly used in making soap and glass and as a source of iodine, is the crude ash produced by drying and burning these seaweeds. As soda and iodine are obtained much more economically from other sources the industry of burning kelp for the ash, once extensive in northern Europe, has greatly declined. The chief use of kelp, as of most other seaweeds, is as a fertilizer, the partially dried plants being applied direct to the soil like a manure. The giant kelps of the California coast, including the elk kelp, BLADDER KELP and BULL KELP, contain a high percentage of potash.

KELSO, a market town of Roxburghshire, Scotland, situated on the Tweed, about 45 mi. southeast of Edinburgh. Its chief interest lies in the remains of the Abbey founded in 1128 by David I, which bore the brunt of English attacks in the days of the Bruce, Baliol, and the Reformation. Sir Walter Scott attended school at Kelso. The manufacture of fishing tackle and farming implements is an active industry. Kelso holds frequent fairs for the surrounding district. Pop. 1921, 3,527; 1931, 3,855.

KELSO, a city in Cowlitz Co., southwestern Washington, situated on the Cowlitz River, a fine salmon-fishing stream, 45 mi. north of Portland, Ore. It is served by steamships and three transcontinental railroads. The region has great tracts of timber; farming, dairying and poultry raising are profitable occupations. The chief industry of Kelso is lumber milling. Pop. 1920, 2,228; 1930, 6,260.

KELVIN, WILLIAM THOMPSON, BARON (1824-1907), English physicist, was born at Belfast, Ireland, June 26, 1824. In 1846 he became professor of natural philosophy at Glasgow, which position he held for 53 years. It might be said of him that during his lifetime he dominated the science of physics through his own researches and inventions, and his contributions cover almost the entire range of the science. He introduced the concept of absolute temperature, and through his researches upon the dynamical theory of heat and the dissipation of energy placed thermodynamics upon a firm basis. Of his more practical work that on submarine telegraphy is the most widely known since it paved the way for the transatlantic cable. As a designer of delicate apparatus he was unsurpassed, and in addition to numerous electrical instruments he invented a new form of compass, a tidal gauge and a machine for making accurate ocean soundings. With PETER G. TAIT he was the author of a *Treatise on Natural Philosophy,* published in 1867. He was knighted in 1866 and created Baron Kevlin of Largs in 1892. He died at Largs, Scotland, Dec. 17, 1907.

KELVIN BALANCE. *See* CURRENT BALANCE.

KEMAL PASHA. *See* MUSTAPHA KEMAL.

KEMBLE, CHARLES (1775-1854), English actor, was born at Brecon, South Wales, Nov. 27, 1775. He is known in the United States as the father of FANNY KEMBLE. But it was his misfortune that as an actor he was for some time only considered because he was a brother of JOHN PHILIP KEMBLE. At length he won a certain appreciation, especially in the rôles of Hamlet, Charles Surface, Petruchio, Benedict, Mercutio, Macduff and Young Mirabel. With his daughter he toured America in 1832-35 with considerable success. He retired in 1840 and died at London, Nov. 12, 1854.

KEMBLE, FANNY (1809-93), English actress whose full name was Frances Anne Kemble, was born at London, Nov. 27, 1809. She was the daughter of CHARLES KEMBLE and niece of Mrs. Siddons. Her first appearance as Juliet at Covent Garden, London, was a great success. She came to America with her

father in 1832 and won considerable praise. In 1834 she married Pierce Butler of Philadelphia, but left him to return to the English stage in 1847. She left England in 1849 and lived in America for several years, giving dramatic readings and writing several volumes of poetry and memoirs. In 1863 she published *Journal of a Residence on a Georgia Plantation,* which embodied her reactions toward slavery. She died at London, Jan. 15, 1893.

KEMBLE, JOHN PHILIP (1757-1823), English actor, was born at Prescott, Lancashire, England, Feb. 1, 1757. He made his first appearance on the stage in 1776 and played Hamlet in London in 1783. He was finally established by his Hamlet, 1783, and by his Macbeth, played with his sister, Mrs. Siddons, as Lady Macbeth, 1785. At Drury Lane he abandoned traditional simplicity and produced with what his contemporaries considered "extraordinary magnificence." Sheridan's conduct as manager of the "Lane" led to Kemble's resignation in 1802, and he became manager of Covent Garden, but this theater burned down in 1808. When the new Covent Garden opened, increased prices caused extensive riots. Kemble was perhaps the last English actor with the genuine grand manner. He made Coriolanus his finest part. A statue of Kemble is in Westminster Abbey. He died Feb. 26, 1823 at Lausanne, Switzerland.

KEMENY, ZSIGMOND (1816-75), Hungarian novelist and publicist, was born at Magyar-Kapud in 1816, of a noble family. He attended the University of Marosvasarhely, studying law there in 1837, and in 1840, went to the University of Vienna, where he studied medicine. He did not enter either of these professions, however, but turned instead to literature and journalism. In 1846 he wrote his first important novel, *Pal Gyulay.* The Revolution of 1848 resulted in a brief period of political exile, and upon his return Kemeny courted unpopularity by espousing the more conservative point of view. He issued vigorous polemics in pamphlets and was editor of various political organs. At the same time he continued to write a series of novels which effectively established his literary reputation. One of the best examples of Kemeny's work is the well-known historical novel *The Fanatics,* 1858-9. In 1867 the author was elected to the Diet for one of the districts of Pest, but soon retired from public life. He died in Puszta-Kamanas, Hungary, Dec. 22, 1875.

KEMMERER, EDWIN WALTER (1875-), American economist, was born at Scranton, Pa., June 29, 1875. Graduating from Wesleyan University, he taught economics at Purdue University in 1901-03, was financial advisor to the United States Philippine Commission in 1903, and chief of the Division of Currency, Philippine Islands in 1904-06. Joining the Cornell faculty in 1906, he was professor of economics and finance in 1909-12, in 1912 becoming professor of economics and finance at Princeton. He was financial advisor to the government of Mexico in 1917, Guatemala in 1919, Chile in 1925, Poland in 1926, Ecuador in 1926-27, Bolivia in 1927, China in 1929, and to Colombia and Peru in 1930-31. In 1924-25 he was a member of the Gold Standard Inquiry Commission for the Union of South Africa, and in 1925 served as expert on currency and banking on the Dawes Committee. He was president of the American Economic Association in 1926, and in 1930 became director of the Bureau of International Finance at Princeton. His several volumes include *Modern Currency Reforms,* 1916, *The ABC of the Federal Reserve System,* 1918, and *High Prices and Deflation,* 1920.

KEMPIS, THOMAS À (c. 1380-1471), German ascetic and mystic, son of a peasant, was born Thomas Hamerken, about 1380, at Kempen, near Düsseldorf, Rhenish Prussia. He entered the Augustinian convent at Mount St. Agnes, near Zwolle, in 1399, taking the vows in 1407, and becoming sub-prior in 1423 or 1425. For the last two centuries he has been regarded as unquestionably the author of *De Imitatione Christi* (1471), a rule of life in seclusion and renunciation, which has been translated into most modern languages as a book of devotion for all Christians. Many of the early editions, including that of 1471, which appears to have been the first, bore his name. The general tradition of his contemporaries ascribed it to him, but on the other hand, it has been credited to John Gerson, chancellor of Paris, or to an unidentified abbot of Vercelli, of the same name, which appears on one MS. It is also known that Thomas à Kempis was a professional copyist, utilizing his calligraphical ability on many early religious manuscripts, for the College of Deventer. It is also said that early lists of his books fail to mention *The Imitation of Christ.* He died at Zwolle in the Netherlands, July 25, 1471.

KENAF, the Russian name for the ambary or Deccan hemp (*Hibiscus cannabinus*), a fiber plant of the mallow family (*Malvaceæ*). It is a tall annual or perennial, with prickly stems and large yellow flowers, native to the Old World tropics and long cultivated in India and other warm countries. The somewhat brittle fiber is used in making coarse fabrics and cordage. In southern Russia the cultivation of Kenaf fiber as a substitute for jute has recently been established.

KENDAL, a municipal borough of Westmoreland, England, about 37 mi. southeast of Carlisle, situated in the beautiful Kent valley. Located here is the castle in which Catherine Parr, one of Henry VIII's wives, was born. Flemish settlers, coming to Kendal in the early part of the 14th century, introduced the woolen manufacture which still is carried on. Fairs and markets are held at Kendal annually. Pop. 1921, 14,146; 1931, 15,575.

KENDALL VS. STOKES (1838), a case which led to a notable decision of the United States Supreme Court settling a serious controversy between the Executive and the Judiciary, and establishing the power of the Circuit Court of the District of Columbia to issue writs of mandamus to Federal officials. Amos Kendall, Postmaster-General under Jackson, had revoked the settlement of certain claims of postal contractors

made by his predecessors. Congress had then referred the claims to the Solicitor of the Treasury, who approved them. Kendall, probably by Jackson's orders, still refused the settlement, whereupon the Circuit Court issued a mandamus. The case, which gave rise to much political feeling, was argued by Richard S. Coxe and Reverdy Johnson for Kendall against Francis Scott Key and Atty.-Gen. Benjamin F. Butler. Justice Smith Thompson, rendering the decision, declared that the mandamus was properly issued to enforce performance of "a mere ministerial act, which neither he nor the President had any authority to deny or control," and that Congress could impose upon any Executive officer duties subject to control of the law and not to the direction of the President.

KENDALLVILLE, a city in Noble Co., northeastern Indiana, about 27 mi. north of Ft. Wayne, in a fertile farming region. Two railroads afford transportation. Grain and garden produce, especially onions, are raised in the vicinity of Kendallville. The city has factories manufacturing pumps, windmills and refrigerators. Several miles southwest is the Tri-Lakes State Hatchery. There are many small lakes in this region. Pop. 1920, 5,273; 1930, 5,439.

KENDYR (*Apocynum venetum*), the Russian name for a Siberian species of Dogbane closely allied to the Indian Hemp. Kendyr is a tall, smooth perennial with reddish reedlike annual stems, 15 ft. or more high, bearing small pink flowers in terminal clusters. The bark yields a soft white fiber of high tensile strength, suitable for making ropes, fish nets, textile fabrics and nitrocellulose products. Since 1930 the cultivation of Kendyr in Russia has been extensively developed by the Soviet Government.

KENILWORTH CASTLE, the largest and finest baronial ruin in England and the scene of Sir Walter Scott's novel, *Kenilworth,* situated near the quaint market town of Kenilworth, Warwickshire. The manor of Kenilworth—the site of a Saxon stronghold in the 9th century, named for Cenwulf, a Saxon king of Mercia—was conferred by Henry I in 1115 upon the Norman Geoffrey de Clinton, who founded the great castle within a wall-enclosed area of seven acres. Through Geoffrey's grandson, it returned to the Crown, remaining the Crown's till Henry III gave it to Simon de Montfort, Earl of Leicester. The castle was an important stronghold during the 13th century baronial wars. Passing to the possession of Henry IV, Kenilworth belonged to the Crown until 1562, when Queen Elizabeth bestowed it upon Robert Dudley, Earl of Leicester. Certain incidents connected with Elizabeth's 19-day visit to Kenilworth in 1575 form the basis of Scott's famous novel. The castle was dismantled in the 18th century by Cromwell's followers. After the Restoration it was granted to an ancestor of the Earl of Clarendon.

Of particular interest at Kenilworth are Caesar's Tower, a Norman keep with walls 13 ft. thick, built by Geoffrey de Clinton; the Strong or Mervyn's Tower built, together with the *Banqueting Hall* and *White Hall,* by John of Gaunt; the Pleasure Gardens and the outer towers, Swan, Lunn's, Water and Mortimer's. Close by are the ruins of Kenilworth Priory, founded in 1122 by Geoffrey de Clinton.

KENILWORTH IVY (*Cymbalaria muralis*), a delicate, trailing, very smooth perennial of the figwort family, called also coliseum ivy and ivy-weed. It grows on rocks, old walls and stony places in the Mediterranean region, is widely naturalized in northern Europe and sparingly introduced in the eastern United States and Canada. The stems, about a foot long, often rooting at the joints, bear small, roundish, ivy-like leaves and attractive blue or lilac flowers borne singly on slender stalks.

KENMORE, a residential and industrial suburb of Buffalo and a branch of the Buffalo post-office, situated immediately adjoining that city, in Erie Co., western New York. Several railroads serve Kenmore, including the Erie and the New York Central. The chief local manufactures are automobile tires, cellophane, electric signs, rayon, machinery and iron and steel. The retail trade amounted to $5,337,480. Pop. 1920, 3,160; 1930, 16,482.

KENNEBEC RIVER, the second largest stream in Maine. This river rises in Moosehead Lake, west central Maine and flows generally southward throughout its course of 175 mi. It empties into the Atlantic Ocean 14 mi. below Bath. Its drainage basin of 6,400 sq. mi. extends to the Canadian border and covers a picturesque, fertile region containing numerous small lakes and ponds. The Kennebec has a fall of 1,023 ft. distributed irregularly over level reaches and rapids. The falls at Augusta and Waterville supply abundant water power. Steamboats can usually ascend the river to Augusta except when navigation is closed by ice in the winter months. Its chief tributary is the Androscoggin which joins it at Merrymeeting Bay.

KENNEBUNK, a town in York Co., southwestern Maine. It is situated near the Atlantic Ocean, 25 mi. southwest of Portland and is served by the Boston and Maine Railroad. In the vicinity are truck farms. Shoes, counters, fibers and extracts are the principal manufactures. Kennebunk is a popular summer resort. Spouting Rock and Blowing Cave are interesting landmarks. The town was founded in 1639 and incorporated in 1820. Pop. 1920, 3,138; 1930, 3,302.

KENNEDY, SIR ALEXANDER BLACKIE WILLIAM (1847-1928), English engineer, was born in Stepney, Mar. 17, 1847, and educated at the Royal College of Mines. He occupied the chair of engineering at University College, London, in 1874-89, and there established the first engineering laboratory. Later he designed light and power plants at Edinburgh, Manchester, Calcutta and in Japan. During the World War he was chairman of the committee on gun-sights and range-finders, and in 1922 he explored Petra, Asia. He died Nov. 1, 1928.

KENNEDY, CHARLES RANN (1871-), American dramatist, was born in Derby, England, Feb. 14, 1871. After leaving school, he became a theatrical business manager and press agent. In 1908

he produced his first successful play, *The Servant in the House.* Later he became actor, and meanwhile wrote *The Winterfeast, The Terrible Meek, The Necessary Evil, The Army with Banners* and other plays. Kennedy was also associated with his wife, Edith Wynn Matthison, in several classical revivals.

KENNEDY, JOHN PENDLETON (1795-1870), American statesman and novelist, was born at Baltimore, Md., Oct. 25, 1795, and graduated from Baltimore College. He studied law, fought at Bladensburg and North Point in 1814, and was successively in the Maryland House of Delegates, in Congress, and Secretary of the Navy under President Fillmore. *Swallow Barn,* 1832, was his first novel, and *Horse-Shoe Robinson* is perhaps his best known book. Kennedy died at Newport, R.I., Aug. 18, 1870.

KENNESAW MOUNTAIN, BATTLE OF, June 27, 1864, an engagement in the CIVIL WAR, which resulted in a temporary check to Gen. Sherman's march to Atlanta. After the BATTLE OF RESACA the Confederate army under Gen. Joseph E. Johnston slowly retreated, each day harrying the advance of the Union forces with a sharp skirmish, which cost Sherman's troops, May 15-June 27, 9,000 casualties against a Confederate loss of 5,500. At Marietta, Ga., Johnston halted, entrenching his army on Kennesaw Mountain. Sherman ordered a desperate assault upon this stronghold, which was repulsed with a loss of about 3,000 men, including Gen. McCook. The defending army lost not more than 600 men. Sherman admitted that the assault was a blunder, and resorted again to maneuvering.

KENNESAW MOUNTAIN NATIONAL MONUMENT, a tract of 60 acres about 2½ mi. west of Marietta in Cobb Co., northwestern Georgia. This monument was established in 1928 under the administration of the War Department to preserve the site of an important Civil War. *See* KENNESAW MOUNTAIN, BATTLE OF.

KENORA (formerly Rat Portage), chief town of the Kenora district, and port of entry, Ontario, Canada, situated near the source of Lake of the Woods, 133 mi. east of Winnipeg. A drop of almost 20 ft. in the Winnipeg River supplies water power for pulp, paper, lumber and flour mills. Kenora is on the route of the trans-Canada highway, which has been completed from Winnipeg to the town. It is served by the Canadian Pacific Railway and by lake steamboats. Pop. 1921, 5,407; 1931, 6,766.

KENOSHA, a lake port city in southeastern Wisconsin, the county seat of Kenosha Co., situated on Lake Michigan, about 35 mi. south of Milwaukee. It is served by the Chicago and North Western Railroad, trolleys and lake steamers. The harbor is excellent, and is open the year around. The principal local manufactures are automobiles, knitted goods, wire ropes, mattresses and brass and iron beds. In 1929 the factory output amounted approximately to $97,000,000; the retail trade was valued at $24,835,617. Kenosha has the city manager form of government. The city was founded about 1835; its name was changed from Southport to Kenosha in 1850, when the city received a charter. Pop. 1920, 40,472; 1930, 50,262.

KENSICO DAM, located on the Bronx River near White Plains, N.Y., is noted for its great height, its massive section, the beauty of its architectural treatment as well as of the lake it creates and its natural surroundings. Because of the great volume of water which it impounds and its location at the headwaters of a stream which flows through the densely populated region north of New York City and also through the upper portion of the City proper, unusual care was taken both in the design and in the execution of the work on this structure. It is a non-overflow, gravity type, concrete dam, faced with cut-granite masonry, 300 feet high above the lowest foundation level and 170 feet high above the stream bed. It has a maximum thickness of 228 feet at the base and is 1830 feet long. Its volume is 1,000,000 cubic yards. The spillway is a separate structure near one end of the dam. The reservoir of four billion cubic feet capacity, which it forms, serves as a reserve storage for water from the Catskill Mountains, brought to it by a long aqueduct constructed by the City of New York as part of its works for supplying water to the city. In an emergency this reservoir alone could supply the city for two months. F. K.

KENSINGTON GARDENS, a charming pleasure ground of 275 acres in London, England, between HYDE PARK and KENSINGTON PALACE. Begun by William III, it was extended by Queen Anne, but owes its finest features to Queen Caroline. With its flower beds, rare shrubs and avenues of splendid trees, the gardens are particularly favored by children. The most notable features are the Long Water, a continuation of the Serpentine in Hyde Park; the Round Pond, so called despite its octagonal shape; the Broad Walk; the Flower Walk; the Albert Memorial; Sir George Frampton's statue of "Peter Pan," 1912; the Sunk Garden; and the Orangery built by CHRISTOPHER WREN, 1704.

KENSINGTON PALACE, a former royal residence on the west side of KENSINGTON GARDENS, London. The mansion was built before 1661 for the 1st Earl of Nottingham and was originally known as Nottingham House. William III purchased it in 1689 from the 2nd Earl of Nottingham, changed its name and commissioned Sir Christopher Wren to rebuild it. It is a plain three-story brick structure, with certain baroque additions made under George I by William Kent. The King's Gallery and the Grand Staircase, both by Wren, are notable features of the palace. William III, George II, Mary II, and Queen Anne died at Kensington Palace, and the childhood of Queen Victoria was spent there.

KENT, JAMES (1763-1847), American jurist, was born at Philippi, N.Y., July 31, 1763. He was graduated in 1781 at Yale and in 1785 was admitted to the bar. In 1793 he became professor of law at Columbia University, in 1804 chief justice of the New York State Supreme Court, and in 1814 judge of

the Court of Chancery. His *Commentaries on American Law,* published in 1826-30 was widely read. He died at New York City, Dec. 12, 1847. In 1900 a bust of Kent was placed in the American Hall of Fame.

KENT, RAYMOND ASA (1883-), American educator, was born at Plymouth, Ia., July 21, 1883. He was graduated from Cornell College, Ia., 1903, and from Columbia University, 1910 and 1917. He taught and superintended schools in Minnesota, 1904-16; was superintendent of Lawrence, Kan., schools and professor of education at the University of Kansas, 1916-20, and dean of the School of Education, 1921-23. In 1923-29 he was dean of the College of Liberal Arts at Northwestern University, and left there to become president of the University of Louisville.

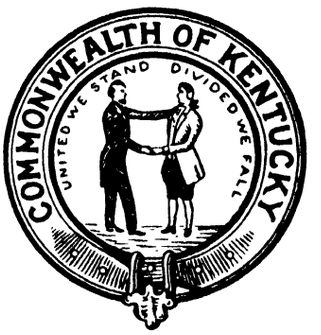
KENT, ROCKWELL (1882-), American painter, author and illustrator, was born at Tarrytown Heights, N.Y., June 21, 1882. He studied with Chase, Henri and Thayer. His art from the beginning was original, formalized and austere. An adventurer, he has written several notable books. *Wilderness,* published 1920, is a self-illustrated account of Alaskan experiences; *Voyaging,* 1924, of a trip to Tierra del Fuego in a life boat; *N by E,* 1930, a saga of the north seas. Kent has also done brilliantly patterned designs for *Candide* and *Moby Dick,* and with Leo Mielziner designed striking murals for the Little Theatre, at Barnstable, on Cape Cod. A good example of his landscape painting is *Winter,* in the Metropolitan Museum, New York.

KENT, a city of Portage Co. in northeastern Ohio on the Cuyahoga River, about 11 mi. northeast of Akron. It is served by four railroads, by bus and interurban trolley lines and is 2 mi. from an airport. The Kent State College of Liberal Arts and Teachers Training is here and also the headquarters of the Davey Tree Experts. Kent is in the midst of an agricultural and industrial district. The principal manufactures are coaches, flour, nuts, bolts and motors. Founded in 1862, Kent was incorporated in 1867. Pop. 1920, 7,070; 1930, 8,375.

KENTIGERN, ST. (6th century), apostle of the northwest of England and southeast of Scotland, was born in Perthshire, England, in the 6th century. He became Bishop of the Strathclyde Britons, evangelized Wales and later continued his missionary work in Scotland. St. Kentigern died in Scotland about 600. His feast is celebrated on Jan. 13.

KENTON, a city of northwestern Ohio, on the Scioto River about 60 mi. northwest of Columbus; it is the county seat of Hardin Co. It is served by three railroads and has an airport. Kenton is the center of a rich agricultural district producing onions and potatoes. Its manufactures include iron toys, advertising signs, sluice gates, electric cranes, machine tools, and cakes and candy. Kenton was settled in 1833 and incorporated in 1845. Pop. 1920, 7,690; 1930, 7,069.

KENTUCKY, one of the south central states of the United States popularly called the "Blue Grass State." It is situated between 36° 30′ and 39° 6′ N. lat. and 82° and 89° 38′ W. long. On the northwest, north, and northeast, it is bounded by Illinois, Indiana and Ohio, from which it is separated by the Ohio River; on the east by West Virginia and Virginia from which it is separated by the Big Sandy River and its fork, the Tug; on the southeast and south by Virginia and Tennessee, and on the west by Missouri from which it is separated by the Mississippi River. Kentucky comprises an area of 40,598 sq. mi. Of this area 417 sq. mi. are water surface, largely the Ohio River. The extreme length of the state is 425 mi. from east to west; its extreme breadth is 175 mi. In size Kentucky ranks thirty-sixth among the states of the Union.



KENTUCKY STATE SEAL

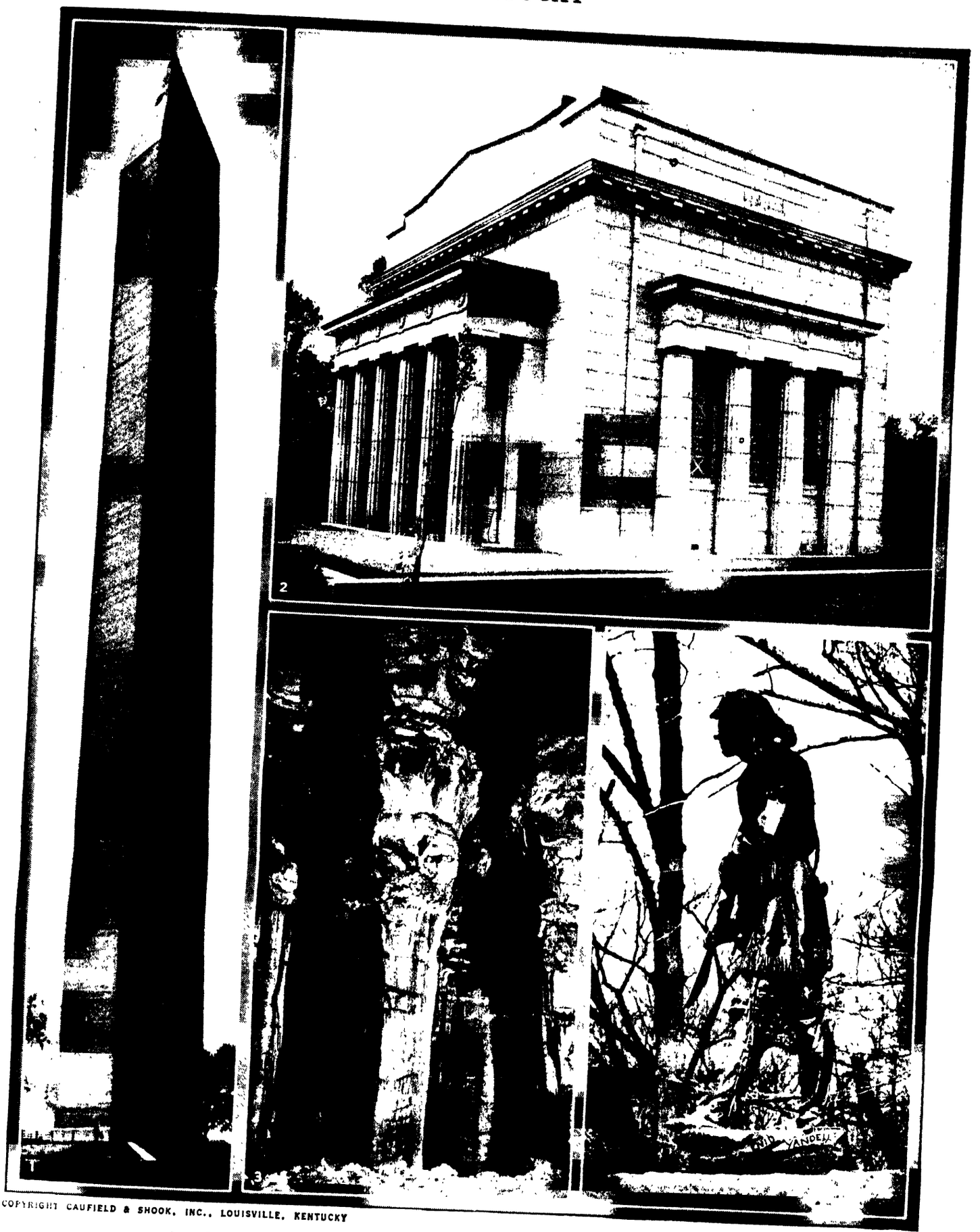
Surface Features. Kentucky declines from mountain heights on the east to the low plains of the Mississippi Valley on the west. The Pine Mountains on the southeastern border and the narrow Cumberland Plateau cover about one-fourth of the area of the state, and the remainder consists of lowlands. The latter include the BLUE GRASS REGION north of Lexington, famous as a grazing land for horses.

The state has a mean altitude above sea level of 750 ft. Big Black Mountains, 4,150 ft., in Harlan County is the highest elevation, and the level of the Mississippi River in Fulton County, 257 ft., is the lowest point. The principal rivers are the Big Sandy, KENTUCKY, CUMBERLAND and TENNESSEE, all of which empty into the OHIO. *See* OHIO RIVER.

Western Kentucky is noted for its caves which are cut in the underlying limestone by subterranean streams. MAMMOTH CAVE in Edmonson County is a notable example.

Climate. With a generally rolling or hilly surface, Kentucky is protected from severe winds and is milder and more equable in climate than most of the adjoining states. The mean annual temperature is 56.5° F., ranging from about 50° F. in the southeastern mountains to 60° F. in the extreme west. At Lexington, in the north central part of the state, the mean annual temperature is 55° F., with an average of 32.9° F. for January and 75.9° F. for July. During the period, 1889-1930, the highest temperature recorded in the state was 114° F. and the lowest, —30° F. The average annual precipitation is 45.8 in. including 14.3 in. of snow.

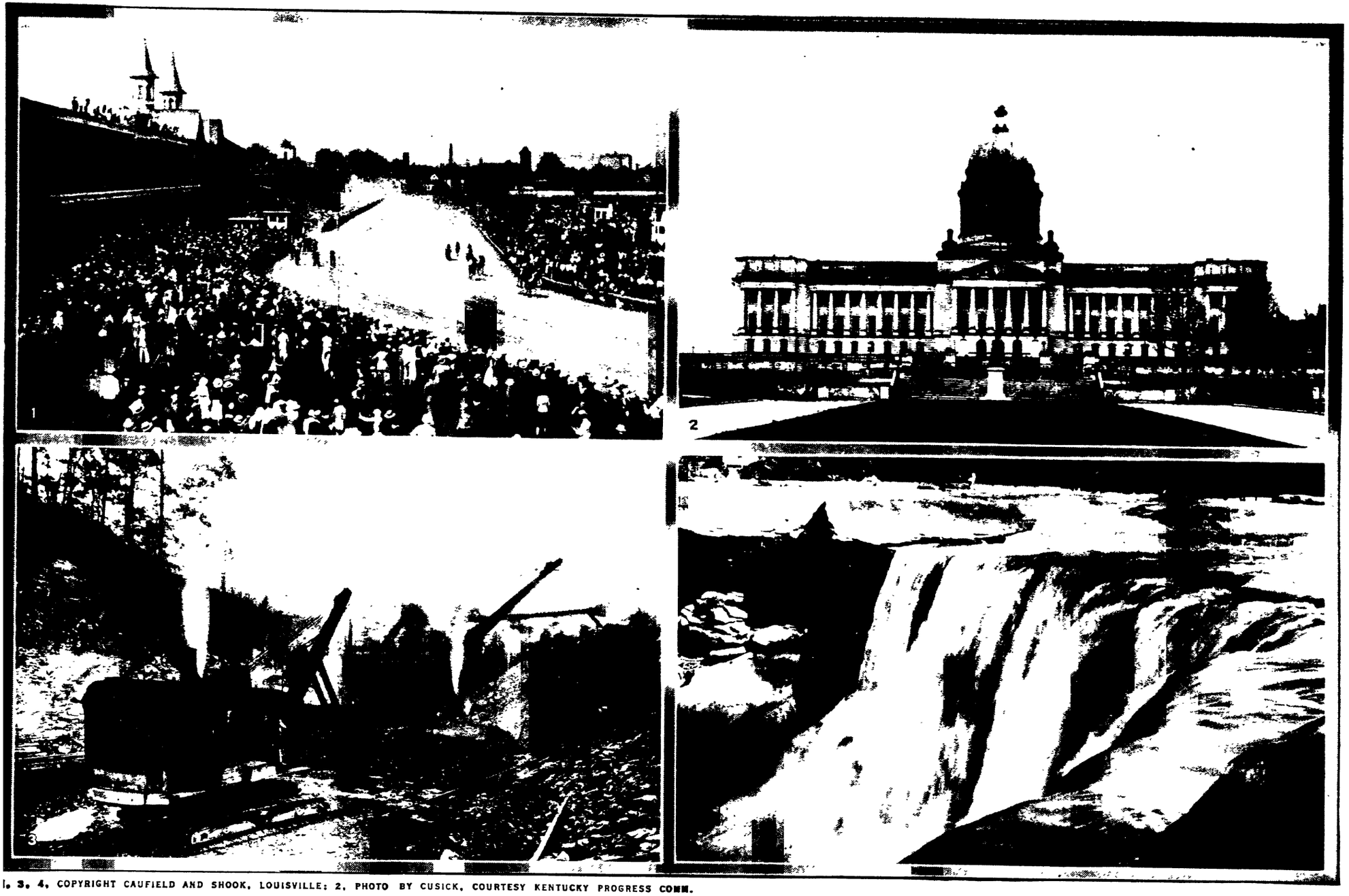
Forests and Parks. Originally 24,320,000 acres of the total land area of 25,715,840 acres were well forested. The remaining areas are chiefly in the mountain section lying east of a line between Portsmouth, O., and Monticello, Ky. Among the predominant trees of this region are beech, sugar maple, chestnut, hemlock, tulip tree, big leaf magnolia, cucumber tree, walnut, Spanish chestnut and shingle oaks. Scrub, pitch and yellow pines are found on the sandstone summits,



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HISTORICAL AND SCENIC LANDMARKS OF KENTUCKY

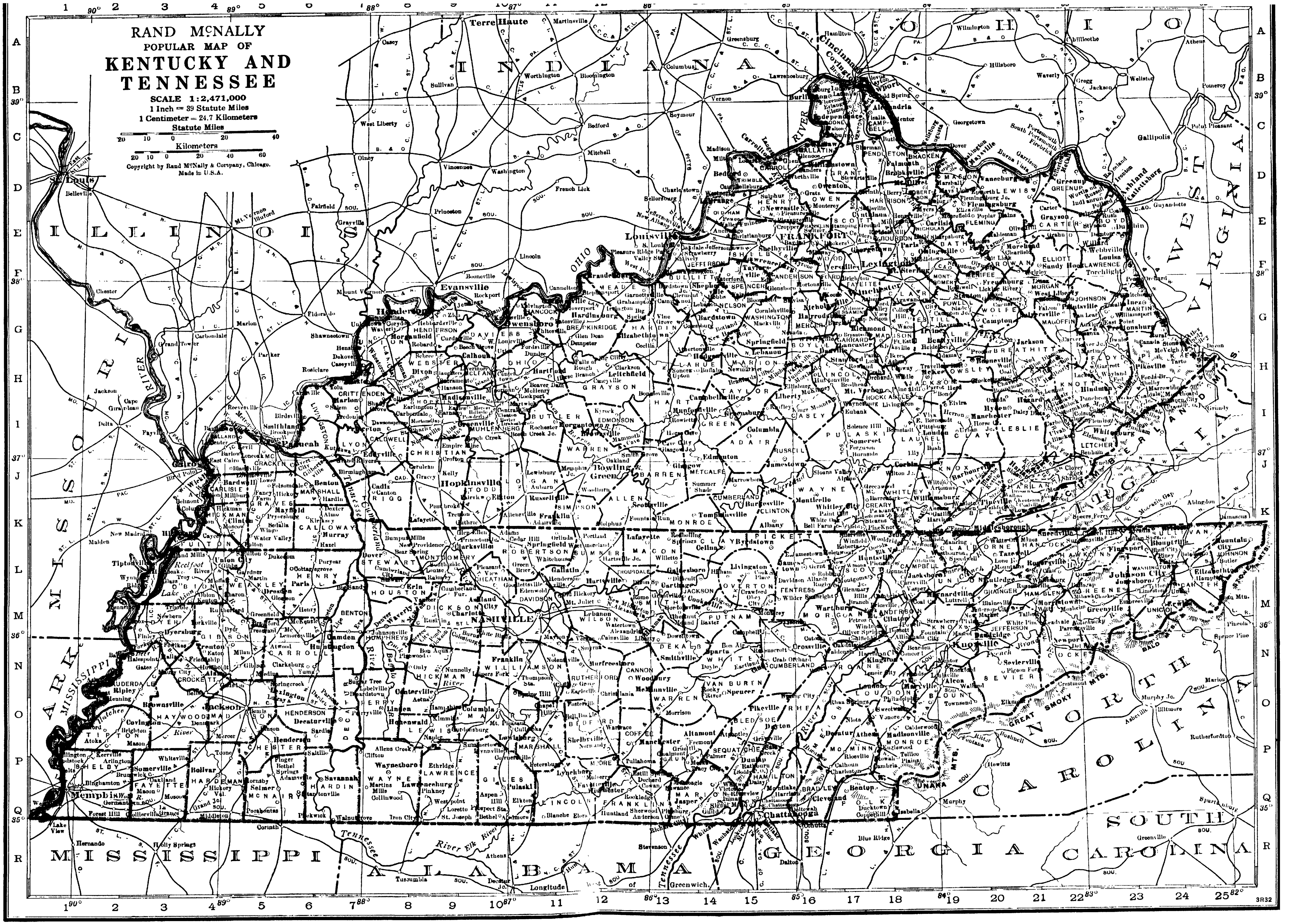
1. Concrete shaft at Fairview, birthplace of Jefferson Davis, president of the Confederate states. **2.** Lincoln Memorial at Hodgenville. **3.** Section of the interior of the Mammoth Cave, Edmonson County, called "The Ruins of Karnak." **4.** Statue of Daniel Boone, famous Kentucky pioneer, by Enid Yandell, in Cherokee Park, Louisville.



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SCENES IN PRESENT-DAY KENTUCKY

1. Famous Kentucky Derby at Churchill Downs, Louisville. **2.** State Capitol at Frankfort.
3. Strip coal mine in the western part of the state. **4.** Brink of Cumberland Falls, Whitley County.


RAND McNALLY
POPULAR MAP OF
KENTUCKY AND
TENNESSEE
SCALE 1:2,471,000
1 Inch = 39 Statute Miles
1 Centimeter = 24.7 Kilometers
Statute Miles
Kilometers
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OHIO
INDIANA
ILLINOIS
MISSOURI
WEST VIRGINIA
VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
ARK.
Louisville
Frankfort
Lexington
Nashville
Memphis
Chattanooga
Knoxville
Cincinnati
Evansville
3R32

The fertile Blue Grass region was originally entirely forested. In the rolling country west of the Tennessee River are wooded areas in which shingle, red, and overcup oaks are mixed with a scattering of beech and sugar maple. Kentenia State Forest, occupying 3,624 acres, has been set aside on Pine Mountain in Harlan Co., southeastern Kentucky. It contains a small amount of virgin timber but is chiefly cut-over land with second growth chestnut oak, white oak, tulip and poplar. Four state parks include the Cumberland Falls, Kentucky Natural Bridge and Blue-and-Gray Park, a region of wild and rugged ravines in Todd Co. Pioneer Memorial Park preserves Old Fort Harrod Hill, the first settlement in Kentucky, established by George Rogers Clark. The Old Rowan Homestead, immortalized by Stephen Foster's song *My Old Kentucky Home,* and where he wrote over 170 songs, has been made a state monument. Abraham Lincoln's Birthplace is a national monument administered by the War Department. *See* LINCOLN'S BIRTHPLACE.

Minerals and Mining. Kentucky contains two extensive coal-producing areas, one in the extreme east and the other in the northwestern section, embracing in all about 8,000 sq. mi. As early as 1827 coal was mined to a limited extent.

With mineral productions for 1929 amounting to $132,649,508 Kentucky stood eleventh among the states, ranking first in fluorspar and asphalt, fourth in coal, and ninth in the quantity of petroleum produced. The outstanding product was coal, 60,462,000 tons valued at $95,647,618. Other important products in order of value were petroleum, 7,775,000 bbls., $13,220,000; natural gas, 27,588,000 M cu. ft., $8,822,000; clay products, $7,062,220; asphalt, 340,346 tons, $2,785,772; limestone, $2,336,085; sand and gravel, 2,350,430 tons, $1,581,501, and fluorspar, 70,827 tons, $1,390,603.

During 1929, 629 mines and quarries gave employment to 61,241 persons, nine-tenths of whom were engaged in the coal industry; to these were paid $69,377,745 in salaries and wages.

Soil. The most fertile soil in the state of Kentucky is found in the BLUE GRASS REGION. It consists of a decomposing phosphatic limestone, excellent for the production of grain, grass, tobacco and fruit. Next in fertility are the bottom lands of the larger rivers which are covered by a rich alluvium. Of less importance are the soils on the highland rim; these vary from clays containing some lime to distinctly sandy loams. On the Allegheny Plateau and in the more elevated mountain districts, the soil is mostly poor and unproductive.

Agriculture. The chief farm crops are grain, tobacco, vegetables, hay and fruits.

In 1930 19,927,286 ac. or 77.5% of the entire land area was in farms, 246,499 in number, with an average size per farm of 80.8 ac. and an average value per acre of $43.73. Of the farm area 6,926,915 ac. or 35% was crop land; 8,119,956 ac. or 41%, pasture land; and 3,393,795 ac. or 17%, woodland. The total value of farm property was $1,029,644,181, of which $871,448,632 was represented by land and buildings; $36,546,828, by implements and machinery; and $121,648,721, by domestic animals.

According to the census of 1930 Kentucky produced in 1929 field crops to the value of $175,297,723, ranking twenty-third among the states. It stood second in tobacco, and twelfth in corn. The chief crops were tobacco, 376,648,533 lbs. grown on 466,118 ac. and valued at $65,091,978; grains, $60,570,106; vegetables, $23,168,272; hay, 1,306,228 tons, $21,811,240, including timothy and clover 698,573 tons; fruits and nuts, $3,993,604, and sweet sorghum, 662,523 gals., $662,523. The leading grain was corn, 61,008,387 bu. produced from 2,644,643 ac.; other grains were wheat, 2,513,443 bu., and oats, 731,543 bu. Among the vegetables were potatoes, $6,280,130; sweet potatoes, $1,520,069, and tomatoes, $544,289. The principal fruits were apples, 1,317,647 bu.; peaches 530,155 bu., and strawberries 8,972,029 qts.

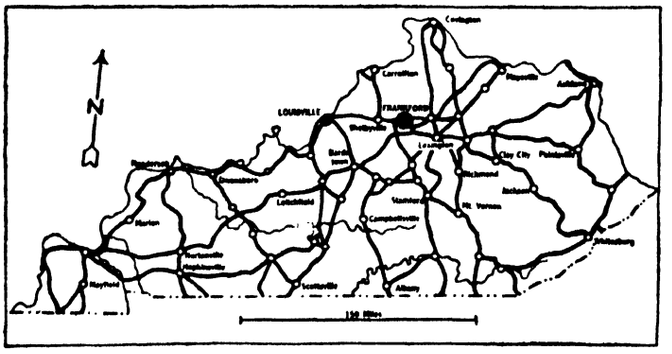
Farm products sold by cooperative marketing rose from $2,430,792 in 1919 to $2,736,445 in 1929. Farm machinery and equipment in 1930 included 86,784 automobiles, 7,188 motor trucks, 7,322 tractors, 1,484 electric motors and 5,326 stationary gas engines.

Animal Industry. Dairying, mule-raising and poultry-growing are important livestock interests. According to the census of 1930 Kentucky ranked seventeenth among the states in total value, $121,648,721, of domestic animals. Among these were 1,087,305 cattle reported from 197,312 farms or 80% of all farms in the state and valued at $52,075,236; horses, 247,955 in number, valued at $16,714,131; mules, 252,250, $21,801,826; sheep, 1,597,223, $12,531,710; swine, 1,041,253, $10,363,951; asses and burros, 2,540, $147,745, and goats, 38,871, $101,802.

Of the cows on farms, 532,348 were kept mainly for milk production and 58,111 mainly for beef production. In 1929, 210,623,997 gals. of milk were produced; the total value of dairy products marketed was $20,819,683. The value of all poultry raised was $14,092,269. The number and value of the chief kinds were chickens, 17,356,111, $12,886,975; turkeys, 383,138, $1,057,813; geese, 73,123, $81,255, and ducks, 92,044, $66,226. The chickens sold, 5,963,132 in number, were valued at $4,899,940. Of 53,960,601 doz. chicken eggs produced, valued at $15,389,015, 33,954,663 doz., with a value of $9,656,142, were marketed. The sheep industry yielded 3,688,181 lbs. of wool valued at $1,474,115. Honey, reaching a total of 1,459,176 lbs. valued at $322,355, was produced from 136,198 hives.

Fisheries. The fish catch of 1930 amounted to 3,044,000 lbs., valued at $174,000, the largest single item being mussel shells. Kentucky issued 60,184 fishing licenses in 1930, but spent only $8,518 in fish propagation, directed by three hatcheries. From these, 53,814 bass were planted in various waters. Plantings in the state by the United States Bureau of Fisheries included 143,595 large mouth black bass, 138,409 small mouth bass and 9,000 other game fish.

Transportation. The Wilderness Trail, marked through the Cumberland Gap by Daniel Boone in 1775, was the first transportation system introduced into Kentucky. This road and the Ohio River were extensively used by the pioneers until 1835 when a railroad commenced operating. Railroad facilities have expanded until now the entire state, with the possible exception of the mountainous eastern section, has adequate railway service. In 1930 aggregate steam railway mileage was 4,033, with the Louisville



KENTUCKY STATE ROADS

& Nashville, Chesapeake & Ohio, Illinois Central and Southern Railway the chief systems. The Mississippi, Ohio, Tennessee and Cumberland rivers are all navigable, and utilized as waterways. The Federal Government has constructed a canal around the falls on the Ohio River at Louisville and has made other improvements on the inland waterways.

The state's highway system is being steadily improved and extended. On Jan. 1, 1930, there were 78,291 mi. of highways, including 17,030 mi. of surfaced roads and 5,528 mi. of state highways. The total highway expenditure during 1929 was $21,234,839, of which $15,109,839 was paid by the state, and $6,125,000 by county and local governments. The state gasoline tax produced a gross revenue of $8,414,733 in 1930. Motor vehicle registrations were 331,002 in 1930 compared with 261,647 in 1925. The growth of trucking facilities is indicated by the large increase in motor truck registration from 26,627 in 1925 to 35,841 in 1930. During the same period the number of buses in operation increased from 378 to 764, or over 100%.

Manufactures. The factory industries of the state have been based in the main upon its agricultural and mineral resources, utilizing in various forms the products of its farms, mines and oil fields.

According to the Census of 1930 Kentucky with manufactures for 1929 valued at $502,638,722 stood twenty-seventh among the states. Its 2,246 establishments gave employment to 10,758 officers and employees, who received $24,979,014 in salaries, and to 77,825 wage earners, who were paid $88,643,659 in wages. These factories used a total of 354,740 horse power, expended $13,298,364 for fuel and power, and $253,260,402 for materials and supplies, and added by the process of manufacture $236,079,956 to the value of their output.

While not highly diversified nearly 70 manufactured products are separately enumerated. Of these, the most important in order of value were iron and steel rolling mill products, $44,890,648; steam railway carshop construction and repairs, $33,054,363; cigars and cigarettes $25,917,627; forest products, $23,489,090, including lumber and timber, $15,486,006, and planing mill products, $8,003,084; flour, $22,617,153; meat packing, $20,161,905, and petroleum refining, $17,311,979.

The chief manufacturing city is Louisville, with an output of $262,547,394, or 52% of the total for the state. Of minor rank were Newport, Covington, Paducah and Owensboro, with products ranging in value from $10,000,000 to $20,000,000 each.

Commerce. According to the census of 1930, there were in 1929 2,049 wholesaling establishments in Kentucky, with total sales of $534,273,131. These organizations gave full-time employment to 22,095 men and women, whose annual salaries aggregated $26,415,865. The chief wholesaling center is Louisville.

The total sales of the 27,267 retail stores amounted to $592,008,879. Sales per store averaged $21,712; sales per capita were $226.43.

CHIEF RETAIL DISTRIBUTING GROUPS

Group	*No. of Stores*	*Sales*	*% of Total*
General Mdse.	7,703	$148,727,999	25.13
Food	7,608	127,667,618	21.56
Automotive	3,343	107,131,526	18.12
Apparel	1,186	43,057,974	7.26
Lumber & Bldg.	1,033	41,022,138	6.93
Furn. & Household	634	22,828,566	3.85
All other stores	5,760	101,573,058	
Total, all stores		$592,008,879	100.00

Finance and Banking. The assessed value of all property in 1928 was $3,064,233,497. The net bonded debt in 1930 was $2,677,627. Total state revenues in 1928 were $33,932,940. The chief sources of income were property and special taxes, $11,637,990, and licenses, $13,402,350. This item included insurance company taxes, motor vehicle taxes and gasoline taxes of $6,058,779. Total expenditures were $35,838,494. The principal items were highway expenditures, $17,231,021, educational aid, $5,757,455, and operation of general departments.

There were 524 banks in Kentucky in 1930. Of these 125 were national banks and 399 state banks and trust companies. Their total capitalization was $43,694,100; their surplus and undivided profits, $42,066,000. Total resources were $643,432,000, with loans and discounts aggregating $414,040,000. Demand and time deposits totaled $419,602,000. Per capita demand and time deposits were $159.79; per capita savings deposits, $55.93. The total savings of $146,860,000 were owned by 378,707 depositors. National bank circulation aggregated $15,105,000.

Government. The legislative power of the state is vested in a general assembly consisting of a senate composed of 38 members and a house of representatives of 100 members, the former elected for terms of

four years and the latter for terms of two years. They meet in biennial sessions limited in duration to 60 days. The chief executive of the state is the governor elected for a term of four years, but ineligible for re-election; his salary is $6,500 per annum. The judicial power of the state is vested in a supreme court known as the court of appeals, consisting of seven judges elected by districts for terms of eight years with salaries of $5,000 per annum.

Social Welfare Institutions. The State Board of Charities and Corrections supervises all charitable and penal institutions. The board has eight non-salaried members. There is a school for the deaf at Danville and for the blind at Louisville. Louisville has a home society for colored children. The white children's home society is at Lyndon. At Pewee Valley is a Confederate Home. State hospitals are located at Lexington, Hopkinsville and Lakeland. The penitentiary is at Eddyville, a reformatory and institute for feeble-minded are at Frankfort and a house of reform and state school for girls at Greendale.

Education. The first school was opened at Harrodsburg in 1776, and the following year another school was established at McAgee's Station. In 1799 the foundation of a state university, to be known as Transylvania University, was laid. A public school law was passed in 1838. By 1928 there were 526,923 pupils and 16,007 teachers in the public elementary schools, with 59,331 pupils and 2,691 teachers in the 598 high schools. In the country districts children from 7 to 12 years, and in the cities, children from 7 to 16 years, are required to attend school the full term.

The number of persons, 5 to 20 years of age, attending school in 1930 was 578,270, or 64.3% of the population within the ages specified, as compared with 519,093, or 62.1% in 1920. Persons 10 years and over unable to read and write numbered 131,545, or 6.6%, in 1930; and 155,014, or 8.4% in 1920. There were 28,553 Negro illiterates, or 15.4%, in 1930, a noteworthy decrease from the 40,548 Negro illiterates, or 21%, in 1920. Among the native white illiterates, there were 101,695, or 5.7%, in 1930, as compared with 112,206, or 7%, in 1920.

Among the state institutions of higher learning are the University of Kentucky at Lexington, the teachers colleges at Richmond and Bowling Green, the normal schools at Murray and Morehead, and, for Negroes, the Western Kentucky Industrial College at Paducah. Prominent private institutions include the University of Louisville, Berea College at Berea, Centre College at Danville and Kentucky Wesleyan College at Winchester. The Kentucky Library Commission has headquarters in the Capitol at Frankfort.

Population. In 1930 Kentucky ranked seventeenth among the states with a population of 2,614,589 or an average of 65.0 per square mile, an increase of 197,959 or 8.2% over 1920. The population rose from 73,677 in 1790 to 1,155,684 in 1860, 2,147,174 in 1900, 2,289,905 in 1910, and to 2,416,630 in 1920. In 1930 there were 2,388,364 or 91.3% whites and 226,040 or 8.6% Negroes, an increase from 1920 of 9.5% whites and a decrease of 4.2% Negroes. Of the whites, 2,366,524 were native born and 21,840 were foreign born. The rural population was 1,815,563 or 69.4% of the total, an increase of 32,476 or 1.8% from 1920; the urban population was 799,026 or 30.6% of the total, an increase of 165,483 or 26.1% since 1920. In 1930 the six largest cities were Louisville, 307,745; Covington, 65,252; Lexington, 45,736; Paducah, 33,541; Newport, 29,744; Ashland, 29,074.

Occupations. In 1930 907,095 persons, or 34.7% of the population, were gainful workers 10 years old or older; 83.8% of these were males and 16.2% were females; 87% were native white, 1.3% foreign-born white, and 11.7% Negro. Among the principal occupations, with number of workers, were farmers, 234,438, and farm wage workers, 68,295; coal mine operatives, 54,315; servants, 4,431 men and 25,453 women; factory operatives, 24,585 men and 13,583 women; clerks, 18,254 men and 8,388 women; retail dealers, 26,286; salespersons, 17,307 men and 7,689 women; factory laborers, 22,794; school teachers, 4,060 men and 13,650 women; carpenters, 15,213; chauffeurs, 13,019; steam railroad laborers, 11,967; laundresses, 11,386, and bookkeepers and cashiers, 10,153.

HISTORY

La Salle passed down the Ohio to the falls opposite the present Louisville in 1669. Arnout Viele of New York opened relations between the Albany traders and the Shawnee Indians in Kentucky, 1692-1694. In 1749 the French claim to the Ohio Valley was asserted by an expedition under Celeron de Bienville, but the Virginian government was then issuing grants of trans-Appalachian land to speculative companies and individuals. Thomas Walker, on behalf of the Loyal Land Company, explored as far as the Kentucky River, 1750, and Christopher Gist, agent of the Ohio Company, approached the falls of the Ohio. The accounts of John Finley, a trader, attracted Daniel Boone to the region in 1767. Boone led the vanguard, which blazed the Wilderness Road, of the expedition, fostered by the Transylvania Company, which founded Boonesborough in 1775. Harrodsburg, established by James Harrod in June, 1774, was the first permanent English settlement in Kentucky. Other pioneer towns were established. The region was organized as Fincastle Co., with Harrodsburg as the county seat, and sent representatives to the Virginia legislature. Neglected during the Revolutionary War, the outposts in Kentucky had to defend themselves against frequent Indian incursions; agitation for a separate state government was a consequence of their isolation. Nine conventions at Danville from 1784 to 1790 demanded separation from Virginia, but were unsuccessful. Baffled, and fearing that the Confederation government would sacrifice the navigation of the Mississippi—essential to the marketing of Kentucky produce—to Spain in return for concessions advantageous to the seaboard states, Kentucky began intrigues for an independent

state and an alliance with the Spanish at New Orleans which involved many leading citizens.

Kentucky was admitted to the Union on June 1, 1792, with a constitution granting full manhood suffrage and otherwise exhibiting the democratic influence of the frontier. Its population exceeded 73,000 in 1790; after ten years of amazing increase, Kentucky numbered 220,955 persons. Lexington was the capital for six months, and thereafter Frankfort. Isaac Shelby was the first governor. The outbreak of the WAR OF 1812 found Kentucky rabidly enthusiastic, its contribution of troops far exceeding its quota. Issues arising from "wildcat" banking and a speculative orgy dominated politics until the slavery issue threatened to divide the state; the "blue grass" slaveholding element was outweighed, however, by the mountaineers and small farmers. Confederate and Union armies contested bitterly for possession of Kentucky (*see* CIVIL WAR). Later politics have been characterized by bitter personal feuds, and by the effect on the party in power of the vicissitudes of tobacco prices. Although a Republican state in the national elections of 1924 and 1928, Kentucky in 1932 returned to the Democratic standard and gave its 11 electoral votes to Roosevelt. Alben W. Barkley, Democrat, was reelected senator.

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KENTUCKY, UNIVERSITY OF, at Lexington, Ky., a coeducational state institution, founded in 1865 as the department of Agriculture and Mechanic Arts in Kentucky University, now Transylvania College. In 1878 this department was removed from the university, transferred to Lexington, and by act of the legislature created into a separate state-controlled institution. In 1907 the title was changed from State Agriculture and Mechanical Arts College to the University of Kentucky. It has agriculture, commerce, engineering, law, scientific, collegiate and graduate courses, and maintains an agricultural experiment station. The library contains 113,439 volumes. In 1931-32 there was an enrollment of 3,651 students, and a faculty of 265 headed by Pres. FRANK LEROND MCVEY.

KENTUCKY COFFEE-TREE (*Gymnocladus dioicus*), a handsome medium sized tree of the pea family, called also nickartree, chicot and American coffee bean. It occurs in rich bottom lands from New York to South Dakota and southward to Tennessee and Oklahoma, but is nowhere abundant. The tree grows usually 40 to 60 ft. high, but sometimes attains a height of 110 ft. with a trunk 3 ft. in diameter. It bears very large leaves divided into numerous leaflets, large white flowers in long clusters and thick leathery pods, often 10 in. long, containing flattened beanlike seeds surrounded by a dark-colored, sweet pulp. In pioneer days the seeds were used as a substitute for coffee.

KENTUCKY RIVER, a river of northern Kentucky, formed by three forks which rise in the Cumberland Mountains and join at Proctor, Ky. The stream flows generally northwest, following a tortuous course, and enters the Ohio River at Carrollton, midway between Louisville, Ky., and Cincinnati, O. The length of the main stream is about 250 mi. Its upper course traverses the coal and iron mining region of the state and the lower part flows through the famous Blue Grass country. Near Frankfort the river has cut a deep chasm through limestone cliffs. With the aid of a series of dams and locks, navigation by steamboat is possible for 60 mi. to Frankfort, while flatboats can proceed 100 mi. farther.

KENYA, a British Crown colony in eastern Africa, extending from the Indian Ocean west to Uganda, and having an area of 224,960 sq. mi. Kenya is a Crown colony except for the small coastal areas belonging to the dominions of the Sultan of Zanzibar, which constitute a protectorate. Prior to 1920 the territory was known as British East Africa.

Stretching across the Equator is a vast area, which, owing to its great height above sea-level, has a cool and pleasant climate suitable for Europeans; large areas of the highlands have in fact been alienated for white occupation. Many sections have a rich volcanic soil and a moderate rainfall. There is much forest in the highlands, including muhuga forests, largely cleared for coffee, at about 5,500 ft. The cedar and the so-called camphor forests grow in the next zone, at from 6,000 to 9,000 ft. Bamboo forests, composed of a single species valuable for the pulp industry, are found at elevations of from 8,000 to 10,000 ft. In addition to the forests there are large areas of farming lands, coffee, maize, sisal hemp and tea being cultivated. Cattle are reared and can be kept out of doors all the year round, danger from native carnivora lessening with closer settlement. The most important coastal product is the coconut palm, and rice, sisal, cotton, kapok, tobacco and fruits are also cultivated. Hides, skins and ghee, or clarified butter, are the principal native products available for export.

NAIROBI, pop. 51,599, is the capital and the chief center of white settlement. MOMBASA, pop. 50,000, has an excellent harbor. A railroad runs from Mombasa through Nairobi to Lake Victoria Nyanza, a distance of 618 mi. Kisunu, a lake port, is also a center of air communications.

Asiatic Indians and Arabs since 1925 have had representation on the legislative council. The Council, however, is dominated by Europeans. Est. pop. 1929, 3,003,158, a figure which includes 16,663 Europeans; 39,504 Asiatics and 12,504 Arabs.

KENYA, MOUNT, a mountain in East Africa, after which the colony is named, situated north of Nairobi, in the center of one of the most fertile districts in Kenya. The mountain is a snow-capped volcanic peak, 18,620 ft. high, with 17 small glaciers. Its slopes are covered with magnificent forests of cedar. Kenya was first seen by a white man in 1849, and its summit was first reached in 1899.

KENYON COLLEGE, at Gambier, O., a privately controlled college and theological school for

men, affiliated with the Protestant Episcopal Church, was founded in 1824, with funds secured in England. Its productive funds in 1931 were $1,911,800. There were 80,000 volumes in the library. In 1931-32 there were 235 students, and a faculty of 27, headed by Pres. William Foster Pierce.

KEOKUK, a city in the extreme southeast of Iowa, a county seat of Lee Co., situated on the Mississippi and Des Moines rivers, about 30 mi. south of Burlington. Bus lines, river craft and four railroads afford transportation. The region produces corn, alfalfa and garden truck. Keokuk's manufactures include steel and brass products, clothing, buttons, shoes and carbide. In 1929 the total factory output was approximately $15,000,000; the retail trade amounted to $9,247,704. A large hydro-electric plant, with a dam nearly a mile long, was built at this point on the Mississippi in 1913. The city was founded in 1820 and incorporated in 1847. It was named for the Indian chief, Keokuk. Mark Twain once lived here. Farmington State Park is northwest. Pop. 1920, 14,423; 1930, 15,106.

KEPLER, JOHANN (1571-1630), German astronomer, was born at Weil der Stadt, near Stuttgart, Dec. 27, 1571. He studied at Tubingen where he attended the lectures of the astronomer Maestlin on Copernicus's views of the universe. In 1594 he was appointed professor of mathematics at Gratz, Austria, where by his writings he drew the attention of TYCHO BRAHE, who called him to Prague in 1600 as mathematician to the court of Rudolph II. Upon Tycho's death in 1601 Kepler became imperial astronomer.

The most important among his thirty odd works are *Astronomia Nova* and *Harmonia Mundi,* in which he published his deductions from the long series of accurate observations made by Tycho. In the former work he enunciated the first two of his three fundamental Laws of planetary motion, while the latter contained the third. This, in a sense the most important, had taken him 17 years of patient research to discover and gave the first indication of a dynamic principle in the universe. Indeed, Kepler was the first to speak of a "force" as impelling the planets to move in their courses, and thus at least dimly perceived the principle of general attraction. A work of less importance was his treatise of *Dioptrics,* which was used by Newton when an undergraduate. He died at Ratisbon, Bavaria, Nov. 15, 1630.

KEPLER'S LAWS. *See* ASTRONOMY.

KEPPEL, FREDERICK PAUL (1875-), American educator, was born at Staten Island, N.Y., July 2, 1875. He graduated from Columbia University in 1898, and from 1902-18 was connected with Columbia, becoming dean in 1910. Keppel was third assistant secretary of war, 1918-19; and director of foreign operations, American Red Cross, 1919-20. After serving as commissioner for the United States International Chamber of Commerce, and as secretary of the Plan of New York, he became in 1923 president of the Carnegie Corporation. His writings include *Columbia University,* 1913, and *Education for Adults,* 1926.

KEPPLER, JOSEPH (1838-94), American illustrator and caricaturist, was born in Vienna, Feb. 1, 1838, and studied art there. He came to America about 1808, and was the first to bring into the United States the use of color lithography in caricature. He founded a German *Puck* in St. Louis, and on its failure, went to New York and became a caricaturist on *Leslie's Weekly,* 1872-77. He helped to found a German *Puck* in New York in 1875, and founded the English version of the comic weekly in 1877. Keppler died in New York, Feb. 19, 1894.

KER, WILLIAM PATON (1855-1923), British scholar, was born at Glasgow, Scotland, Aug. 30, 1855, and studied at Glasgow and at Oxford. He served as professor of English literature at Cardiff from 1883-89, at University College, London, from 1889-1922 and was subsequently appointed to the chair of poetry at Oxford. His writings, chiefly on medieval literature, include *The Dark Ages,* 1904, *Essays on Medieval Literature* and *The Art of Poetry,* 1923. Ker died at Macugnaga, Italy, July 17, 1923.

KERENSKY, ALEXANDER FÉODOROVICH (1881-), Russian political leader, born in the government of Samara in 1881. After 1913 he was a Socialist member of the Duma, and in March 1917 became a member of the Provisional Government, being successively minister of justice, war minister and prime minister until the Bolshevist revolution. In November he was defeated by the Bolshevists at Tsarskoye-Selo and escaped to England. His works include *The Prelude to Bolshevism* and *The Catastrophe.*

KERESAN, a North American Indian linguistic stock comprising two dialectic groups and confined entirely to Pueblo tribes living in villages on the Rio Grande between the Rito de los Frijoles and the Jemez River, and on the Jemez as well. The two westernmost pueblos of the group, Acoma and Laguna, are to the west of the Rio Grande; Laguna is situated on the Rio San Jose. The Queres dialectic group includes the Pueblo villages of Santo Domingo, Santa Ana, Sia, San Felipe and Cochiti; the Sitsime or Kawaiko dialectic group includes Laguna and Acoma.

KERGUELEN, also called Desolation Land, an island of the Indian Ocean, lying at 50° S. lat. and 70° E. long. It is 85 mi. long, but is narrow and covers an area of but 350 sq. mi. The coastline is very irregular and the surface generally mountainous, broken by deep valleys. The highest summit is Mt. Ross, 6,117 ft. above the sea. The island was discovered by the French navigator Kerguelen in 1772. Since then it has been visited by many explorers. In 1893 France took official possession of it, and in 1924 the island became a dependency of Madagascar.

KERKYRA. *See* CORFU.

KERMAN or **KIRMAN,** a city of Persia and capital of the province of Kerman, located in a rich section on the motor route between Yezd and Isfahan about 400 mi. distant from the latter city. The town is enclosed by high walls and has many bazaars and mosques. The Masjid-i-Malik mosque dating from the 11th century has lately been rebuilt. At one time

Kerman was noted for its shawls, made of soft goat's hair but now carpet making constitutes the chief industry. Brass-works, silk and woolen goods, and felt are also made. The province grows opium, wheat, barley, rice, maize and beet root. Among the inhabitants are Jews, Armenians, Hindus, Kurds and Persians. Est. pop. 1930, 50,000.

KERMANSHAH or **KIRMANSHAH,** principal city of the Persian province of the same name situated in a productive region near the Kara-Su, about 250 mi. southeast of Tehran. The city occupies a commanding position on the trade route between Baghdad and the capital of Persia. It is the center of distribution for horses, grain, gum, opium, castor-oil and fruits. At one time the city engaged extensively in carpet weaving, but this industry has practically disappeared. The walls which once surrounded Kermanshah are now in ruins. Est. pop. 1930, 45,000.

KERMESSE, also known as Kirmess and Kermes, church Mass, i.e., a Mass to celebrate the feast day of a church and its anniversaries. In the Netherlands and the north of France such festivals were held annually and were characterized by feasting, dancing and various sports. The Brussels Kermesse still survives and a procession with figures of medieval heroes takes place. They are common elsewhere also, but are now nothing more than country fairs, although in South Germany and Austria the fairs and accompanying amusements are frequently held in conjunction with religious services. In Protestant parts of Germany, such fairs with jollifications are still called *Messen* (Masses), though the ancient religious significance is rarely recalled by the merrymakers.

KEROGEN, a solid, yellow or brown organic substance found in OIL SHALES, and in cannel and some other coals. Heat and pressure will distill PETROLEUM from kerogen, either by natural process, or artificially as in the oil shale industry. Kerogen probably consists of water deposited plant structures, such as spores and pulp. *See also* CANNEL COAL.

KEROSENE, a HYDROCARBON oil mainly used in wick lamps for lighting and in oil stoves for heating. It is secured in the distillation of PETROLEUM immediately after the removal of the GASOLINE fraction and ranges in gravity from 36° to 49° Baumé. The most commonly used grades are "water" white and "prime" white, which are light in weight and highly refined. A somewhat heavier and less pure product, kerosene distillate, is used in certain INTERNAL COMBUSTION ENGINES and sometimes in OIL BURNERS.

KERR MAGNETIC EFFECT. *See* MAGNETO-OPTICS.

KERRIA (*K. japonica*), a bramble-like, but spineless, shrub of the ROSE FAMILY widely planted as an ornamental. It is a native of eastern Asia with numerous foliage and floral varieties in cultivation. The plant grows about 5 ft. high with green, somewhat angular branches, oblong, sharply toothed leaves and showy golden-yellow flowers, 1 to 2 in. across, blossoming throughout the summer. The commonly planted varieties have double flowers; there are also numerous races with yellow-striped stems and white-margined leaves.

KERVYN DE LETTENHOVE, JOSEF MARIE BRUNO CONSTANTIN (1817-91), Belgian historian, was born at St. Michael, West Flanders, Aug. 17, 1817. He became a member of the Belgian Chamber of Deputies and was minister of public education (1870-1). He attained eminence in science and archeology, but he is best known for his historical writings, his work on *Froissart* winning a crown from the French Academy. His chief works are the *History of Flanders* (4 vols., 1847); *Huguenots* (6 vols., 1883-85); and *Marie Stuart* (2 vols., 1890). Kervyn died at Brussels Apr. 3, 1891.

KESTREL, the common name for a genus (*Tinnunculus*) of small falcons ranging practically throughout the world. The European kestrel or windhover (*T. alaudarius*), one of the commonest of British birds, is found throughout Europe and in most of Asia. It is somewhat over a foot long, the male being chiefly bluish-gray, buff and black and the female reddish and buff. The kestrel feeds mostly on mice and other small animals, hovering over one spot to detect its prey and then swooping down upon it. It nests usually in the abandoned homes of other birds, and lays 4 to 7 creamy-white eggs blotched with red. The American sparrow hawk is related to the kestrels.

KETCH. *See* YACHT.

KETCHIKAN, an inland port in southeastern Alaska, in the first judicial division, situated on the Tongass Narrows, 650 mi. northwest of Seattle, Wash. The town, which is served by numerous steamship lines, is a leading shipping point for a wide area producing timber and valuable minerals. Halibut fishing is the most important interest. Salmon and other fish industries and fox farming are also profitable. During 1929, 2,671 vessels entered and 2,237 cleared the harbor for foreign and coastwise destinations. The town was founded in 1899; incorporated in 1902. Pop. 1920, 2,458; 1930, 3,796.

KETONES, organic substances characterised by the CO group, to which are attached two monovalent organic radicals. They stand in the same relation to secondary alcohols as the aldehydes to the primary alcohols, and may be prepared by simple oxidation of the corresponding alcohol, or by the distillation of salts of fatty acids. They are as volatile as, but smell more pleasantly than, aldehydes, and although very active chemically, are not so easily oxidized as aldehydes, and differ from them in the further respect that oxidation, when it does take place, does not convert them into their corresponding single acid, but breaks down the molecule into a mixture of acids. *See also* ACETONE.

KET'S REBELLION (1549), an insurrection which broke out in the east of England, largely in protest against the enclosure of the common lands and dislike for the protector Somerset. Robert Ket, the leader, refused Edward VI's offer of amnesty and, being crushed by royal troops, was executed. *See* ENCLOSURES.

KETTLE-DRUM, a percussion orchestral instrument; so named because of its resemblance to a kettle; *see* DRUM.

KEWANEE, a city in Henry Co., northern Illinois, situated 52 mi. northwest of Peoria. It is served by the Burlington Route and an electric connection with the Rock Island Railroad. The city has substantial industries and coal-mining interests. In 1929 the manufactures amounted approximately to $12,000,000; the retail trade reached a total of $9,609,707. Pop. 1920, 16,026; 1930, 17,093.

KEW GARDENS, the home of the Royal Botanic Gardens, in the London suburb of Kew, Surrey, England. The grounds of 270 acres originally belonged to two royal residences, Richmond Lodge, demolished in 1772, and Kew House, demolished in 1803. The botanic garden was established there by Dowager Princess Augusta in 1760, and was presented to the nation by Queen Victoria in 1841. In the present gardens—which include four museums, the largest herbarium in the world, and various ponds, dells and conservatories—there are more than 24,000 species and varieties of plants. Also of interest are the numerous small temples built by Sir William Chambers, the Chinese Pagoda, dating from 1761, and Kew Palace, or Dutch House, once an annex of Kew House.
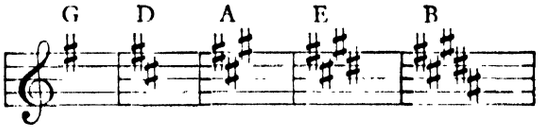
KEY, ELLEN KAROLINA SOFIA (1849-1926), Swedish social writer and lecturer, was born at Sundsholm, in Smaland, Dec. 11, 1849. As a champion of the rights of the individual, and more particularly of the rights of woman as an individual, her influence has been world-wide, and her books have been translated into many languages. Ellen Key's writings on the problems of marriage and the upbringing of children were considered revolutionary by many. Among her books are *The Morality of Woman, The Renaissance of Motherhood, The Misuse of Woman's Power, Woman's Psychology, Woman's Logic, Life-Lines, The Younger Generation* and *War, Peace and the Future.* She died at Sundsholm, Apr. 24, 1926.

KEY, FRANCIS SCOTT (1779-1843), American poet and lawyer, was born in Frederick County, Md., Aug. 1, 1779. He was educated at St. John's College, became a lawyer and was District Attorney in Washington from 1833-41. His reputation, however, rests upon his anthem, *The Star-Spangled Banner.* Key had gone, in 1814, to the British fleet on behalf of a captured friend, and was himself detained during the all-night bombardment of Baltimore. The famous song was inspired by the sight at dawn of the American flag still floating over Fort McHenry. Key's collected poems were published in 1875. He died at Baltimore, Jan. 11, 1843.

KEY, in music, a term used with reference to the scale, the first note of which is called the keynote, while the key proper refers to the intervals upon which a scale, based on that keynote, is built. In European music of the classical and modern periods, only two modes, major and minor, are commonly recognized; all major scales are thus absolutely identical in construction, as are all minor, and differ only in having different starting-points, or keynotes, which necessitate certain alterations of the STAFF, known as sharps and flats. By the latter, known as the signature, the key of a composition is determined and is thus said to be in the key of G (one sharp), the key of F (one flat), and so on. The following table shows the sharps or flats of the most commonly used keys, major and minor:

Sharp keys

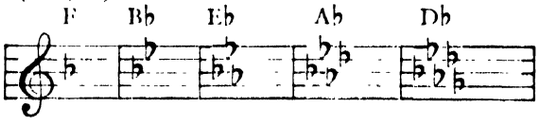
Key of (major) G D A E B



Key of (minor) E B F♯ C♯ G♯

Flat keys

Key of (major) F B♭ E♭ A♭ D♭



Key of (minor) D G C F B♭

In addition, there are two natural keys without sharps or flats, namely, C-major and A-minor. *See also* NOTATION; SIGNATURE; ACCIDENTAL; STAFF; CLEF.

KEY INDUSTRIES, a term which grew out of the subject of economic independence in England during the World War, and was applied to industries of peculiar military importance. England was largely dependent upon Germany for such products as synthetic dyes, spelter, tungsten, optical and chemical glass, and drugs. Not being equipped to produce these products, the realization of their importance to other and larger industries such as textiles and steel was keenly felt when the demand for them was increased due to the war and when their supply was shut off.

Key, or pivotal industries as they are sometimes called, became an added argument for those in favor of a protective policy. Even free trade (*see* FREE TRADE AND PROTECTION) advocates saw the need of greater self-sufficiency where they were concerned, but they advised a special consideration in the production of them, favoring government monopoly or subsidized private production rather than tariff protection. The passage of The Safeguarding of Industries Act in 1921 by Parliament was part of the program to protect and maintain key industries during times of peace. It imposed duties on cameras, optical lenses, various scientific instruments, and upon certain chemical products.

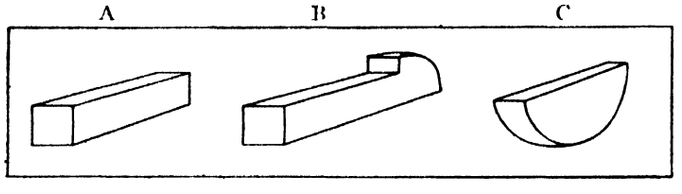
It is difficult to determine what may be a key industry since a product essential to military self-sufficiency at one time may lose that significance with more modern means of warfare, and new key industries very likely will be created. In another war, for instance, it is conceivable that the manufacture of some special alloy of steel involving the use of a rare

metal might become a key industry. Since key industries are those which are essential in time of war, shipbuilding and steel production may be placed in this classification. The term has come into a more generalized usage since the war, and such products as food and clothing are sometimes considered key industries in the sense that they are essentials, although they are, more strictly speaking, staple rather than pivotal industries. M. J. Q.

KEYNES, JOHN MAYNARD (1883-), British economist, was born at Cambridge, June 5, 1883. He was a member of the Royal Commission on Indian Finance and Currency in 1913-14, and was associated with the British Treasury during the World War. Chief representative in 1919 of the Treasury at the Versailles Conference, he disagreed with his colleagues on certain financial features of the treaty, and resigned his post. He published his theories and conclusions in *The Economic Consequences of the Peace,* 1920, which won international notice. He became bursar of King's College, Cambridge, and in 1924 chairman of *The Nation,* Ltd. In addition to the aforementioned volume he has published *The End of Laissez-Faire,* 1926, and *A Treatise on Money,* 1930.

KEYPORT, a borough in Monmouth Co., northeastern New Jersey, situated on Raritan Bay, 22 mi. southwest of New York City. It is served by the Central of New Jersey Railroad and by steamships. The borough's chief activity is concerned with a coastwise trade. Pop. 1920, 4,415; 1930, 4,940.

KEYS, in mechanics, are pieces of metal which prevent one part from moving on the other, as a PULLEY on a SHAFT; usually they are square pins or bars that fit in a groove or keyway. Most of them fit tight in both members and prevent all movement,



TYPES OF KEYS
A. *Square;* B. *Gib Head;* C. *Woodruff*

though, in some cases, they are loose in one member so that they can slide longitudinally in the keyway while preventing turning. Round keys are sometimes used. A special type, known as the Woodruff key, is widely employed and consists of a section of a flat disc, as shown in the figure. Keys are also made with projecting heads, and are both straight and tapered.

KEYSER, a city and the county seat of Mineral Co., on the northeastern boundary of West Virginia, situated on the Potomac River, 21 mi. south of Cumberland, Md. Two railroads serve the city. The chief local industries are pottery and knitted goods, manufacture and railroad shop work. Timber, fruit and livestock are the principal products of this region. Keyser is the seat of the Potomac State School. The city was known first as Paddytown and later as New Creek. Keyser was incorporated in 1873 and became a city in 1913. The railroad car shops of the Baltimore and Ohio railroad are located here. Pop. 1920, 6,003; 1930, 6,248.

KEYSERLING, HERMANN ALEXANDER, Count (1880-), German philosopher, was born at Konno, Livonia, July 20, 1880. During 1907-12 he traveled extensively, his contact with the Orient having considerable influence on his philosophical belief. His *Travel Diary of a Philosopher,* 1919, attracted much attention, particularly in the United States where it appeared in 1925, as did *The Book of Marriage,* 1926, and *America Set Free,* 1929. Count Keyserling founded the School of Wisdom at Darmstadt. In 1919 he married a granddaughter of Prince Bismarck.

KEY WEST, a port city situated on the westernmost Florida key, a small coral island off the coast of Florida in the Gulf of Mexico. It is the county seat of Monroe Co. The Florida East Coast Railroad, steamships, airplanes and bus lines afford transportation. There is also a railroad ferry to Cuba. Key West is a winter resort, uniquely beautiful with jasmine, almonds, palm trees, oleanders and other semi-tropical flora. The chief industries are cigar manufacture, sponge fishing, the handling of goods for shipping and the development of crawfish hatcheries. In 1929 the factory output reached about $1,000,000; the retail trade amounted to $3,100,494. Situated in a strategic position, Key West is an important government army post, naval station, and submarine base. It is believed that the island was a pirate stronghold in the early days. Key West was incorporated in 1832. Ft. Taylor was built in 1846. Pop. 1920, 18,749; 1930, 12,831.

KHAKI ELECTION, the name given to the General Election of 1900 in England, derived from the fact that uniformed soldiers spoke in the streets in support of the Conservative Government, then carrying on the BOER WAR. The name was also applied to the General Election of 1918, when Lloyd George and his party sought reelection on the basis of having guided England to victory. Their platform planks advocated bringing the Kaiser to trial and making Germany pay the entire costs of the war, and their argument was that only the successful war government could be trusted with the peace terms.

KHANIA. *See* CANEA.

KHARKOV, the capital city of the Ukrainian S.S.R., in southwestern Russia at the confluence of the Kharkov and Lopan rivers. The proximity of the Donetz coal basin, the Krivoy-Rog iron district and productive agricultural communities make it one of the chief economic centers of the Ukraine. The city is chiefly a trading and machine-making center. The annual fairs are important financially to the whole republic. Kharkov was founded in 1654 as a stronghold against the Tatars. The Russian conquest of the Black Sea shores opened new avenues of commerce, and in the middle of the 19th century the city became industrialized. In the 1905 revolution Kharkov workers declared a general strike; during the

1917 struggles it was the center of bitter fighting among Germans, Whites and Reds, finally becoming part of the Soviet Union late in 1919. It is the headquarters of the southern coal, steel and machinery trusts, and its factories make elevators, tractors, hydroelectric generators, locomotives, sewing-machines, tobacco products, candy and other commodities. Railroads and air lines meet here. Of almost a score of educational institutions, the All-Ukrainian Marxist Institute and the Institute of Public Instruction are foremost. There are many museums, including the Museum of the Free Ukraine and another devoted to agricultural exhibits. The Uspenski Cathedral, built in Baroque style, is the most interesting of numerous religious edifices. The city supports a dozen newspapers. Approximately one-half the population is Ukrainian, minorities being Great Russians, Jews and Poles. Pop. 1926, 417,342.

KHARRIAN or **KHURRIAN,** an extinct language spoken probably in the Armenian mountains, preserved in CUNEIFORM texts found at Boghaz-köi, and closely related to Mitannian and ELAMITIC.

KHARSIVAN. *See* ARSPHENAMINE.

KHARTOUM, the capital of Anglo-Egyptian Sudan, situated at the junction of the Blue and White Niles. It is the center for river and railroad traffic of the Nile valley. OMDURMAN on the opposite bank of the White Nile is now connected with the city by an imposing bridge and road.

Khartoum was rebuilt after its almost total destruction in 1885. Among the important buildings are a mosque for Mohammedans, a cathedral, the Gordon College and extensive government houses. Opposite Khartoum, on the Blue Nile, is Khartoum North, with a population of 14,319.

The evacuation of the Sudan had been entrusted to General Gordon, whose tragic end was due to his refusal to surrender Khartoum to the Mahdists and also to the British government's delay in sending relief. Troops marching to his aid sighted the city only a few hours after it had been sacked, Jan. 26, 1885. Pop. 42,240. *See* SUDAN: *Anglo-Egyptian Sudan.*

KHATTIAN, an extinct language of central Asia Minor preserved in over 50 fragments in CUNEIFORM, usually accompanied by translations in KANISIAN, and found at Boghaz-köi. Its linguistic affinities are as yet undetermined, but one of its characteristics is the use of prefixed rather than suffixed inflectional endings, e.g., *binu,* "child," *le-binu,* "children."

KHAZARS, a tribe of Turkish (some scholars think of Tartar or Finnish) origin, which settled down in the south of Russia, near the Caspian Sea, and embraced Judaism, under their King Bulan, in the middle of the 8th century. At first they settled on the northern slopes of the Caucasus and in the region of the Don and Volga rivers; however, as early as the 4th century they embraced the entire region between the territory of the Finns on the north, the Bulgars on the west, the Armenian River Araxes on the south, and the Turks on the east. The Khazars were semi-nomads, practicing agriculture, sheep-raising and commerce. In the 7th century they conquered the kingdom of the Bulgars. The rulers of Byzantium and the Russian dukes of Kiev paid them tribute, and sought their friendship. Soon after their conquest of the Bulgars they occupied an immense portion of the Crimea, as well as Kiev, then the most important and largest Slavic city of the south.

The head of the Khazars was a king, called "chagan" or "chakan," who was likewise the supreme religious head of the state. Their religion itself was coarse and idolatrous, combined with much sensuality and lewdness. Their cities were few in number; but their capital city was a great trading-center to which merchants, Russian, Bulgarian, Greek and Jewish, came in large numbers. Thousands of Jews from Asia Minor and the Byzantine empire settled there under the protection of the chagans. These Jews vied with the Mohammedans and the Christians in their attempts to convert the Khazars to Judaism. Finally, as the result of a religious disputation between representatives of the three great religions, the Chagan Bulan, in the 8th century, was convinced of the superiority of Judaism as the one true faith. Bulan thereupon not only accepted Judaism for himself, but also declared that all the people of his kingdom were to do likewise. During the two hundred years of the existence of this Jewish kingdom no intolerance was shown to the adherents of the other religions; indeed, all the three great religious groups, as well as the pagans, were represented in the supreme court of justice of the Khazars.

The Khazar kingdom was overthrown in 965 by a coalition of the Russians, who had meanwhile been converted to Christianity, under the leadership of the Duke of Kiev, and of the Byzantians. The Khazars fled to Central Asia, Spain and the Crimea, where they soon intermingled with the native peoples and became lost to history. In 1016 the Greeks and Russians destroyed the last vestiges of the Khazars in the Crimea. A. SH.

BIBLIOGRAPHY.—Graetz, *History of the Jews,* 1926; *Jüdisches Lexikon,* vol. 1, cols. 1346-50.

KHERSON, a city and river port of the Ukrainian S.S.R., situated on the right bank of the Dnieper River, about 25 mi. from the Black Sea. Enormous quantities of grain are exported from its harbor, steamers being loaded from floating grain elevators. In 1778 Kherson was established as a naval center, and shipbuilding became the foremost industry. The transfer of military wharves to Nikolaev hindered the city's progress, but in recent years it has advanced rapidly as a trading and exporting market, and has a large agricultural implement factory. The materialization of the Dnieper electrification plan is increasing its growth. The Historico-Archeological Museum and a scientific experiment station are important features of the city. Pop. 1926, 58,801.

KHINGAN, two mountain chains in eastern Asia, between Mongolia and Manchuria, consisting of Great Khingan and Little Khingan. In 1887 the system

was first traversed and surveyed by M. Garnak at a mean altitude of 5,000 ft., with peaks rising to 6,500 and occasionally 7,000 ft. Between Vladivostock and Kiren the Great Khingan is connected through the Little Khingan with two distinct massifs. The ranges are from 80 to 100 mi. wide. The region is rich in timber and poplar; willow and birch flourish.

KHOTANA, a collective name for the Athapascan-speaking Indian tribes living on the Lower Yukon, Cook's Inlet and the Koyukuk River, in Alaska. These are the Kaiyuhkhotana, the Knaiakhotana, Unakhotana and Koyukukhotana.

KHUFU. *See* CHEOPS.

KHYBER PASS, a military road in the mountains between the Punjab and Afghanistan, winding 30 mi. north-westward and sometimes narrowing in width to less than 20 ft. The cliffs on each side are sheer walls rising vertically up to high mountains on either side. India's mountain rampart is complete, and great importance is attached to the few possible passes of which the Khyber is most famous. Undoubtedly the weakest region is in the northwest, on the Afghan frontier, and it is from this direction that India has been invaded again and again since the time of Alexander the Great. Khyber Pass is one of the most famous of all passes. By a treaty made in 1879 the Anglo-Indian authorities have full control of it.

KIAOCHOW, a district on the southern coast of the Shantung peninsula, China. Tsingtau is the chief town and port. In 1898 the bay and surrounding coast, 193 sq. mi., were leased for 99 years to Germany. At the end of 1914 the territory was surrendered to the Japanese after a defense of four months by the German garrison. By the treaty of peace of 1919 the German rights in Kiaochow were transferred to Japan, and restored to China in 1922, in accordance with the terms of the Washington Pact, 1921. Pop. 165,000.

KICHAI, a North American Indian tribe speaking a language of the Caddoan linguistic stock, closely affiliated with the PAWNEE, though they are most similar in culture to the Wichita with whom they have been associated since the middle of the 19th century. Their original habitat was in Louisiana and Texas, whence they conducted raids against the neighboring tribes, using horses which they obtained early in their contact with whites. As a distinct tribe they no longer exist.

KICKAPOO, a North American Indian tribe belonging to the central group of the Algonkian linguistic stock, forming a division with the Sauk and Fox with whom they are closely integrated culturally and linguistically. Their territory, when first encountered in the 17th century, was in Columbia Co., Wis. From here they gradually extended their range, partially through conquest, to the vicinity of the Milwaukee River and thence to Peoria and the drainage of the Wabash, playing an important part in the history of that general area throughout the first half of the 19th century. After this period a portion of the tribe went to Texas and later to Mexico; part of this group was later brought back and settled in Indian Territory, while the remainder are settled on a Reservation in the Santa Rosa Mountains of Eastern Chihuahua. There are now several hundred Kickapoo living in Kansas and Oklahoma. In their original habitat they were typical Central Algonkians, living in permanent villages, in bark houses in summer and in reed houses in winter. They were agriculturists, raising corn, beans and squash, though when living west of the Mississippi they often hunted the buffalo, also raiding for horses and coming into close contact with the Indians of the Plains. They claim to have practiced in the past the *midewin* ceremony, but their most sacred modern ceremony is the feast dance of the gentes. The dog is considered sacred and sacrifices are offered to it. They were organized into an exogamous gentile system.

KIDDERMINSTER, a municipal borough of Worcestershire, England, situated on the Stour and on the Staffordshire-Worcestershire Canal, 135 mi. northwest of London. Of Saxon origin, it was a royal possession from the 9th century until Henry II granted

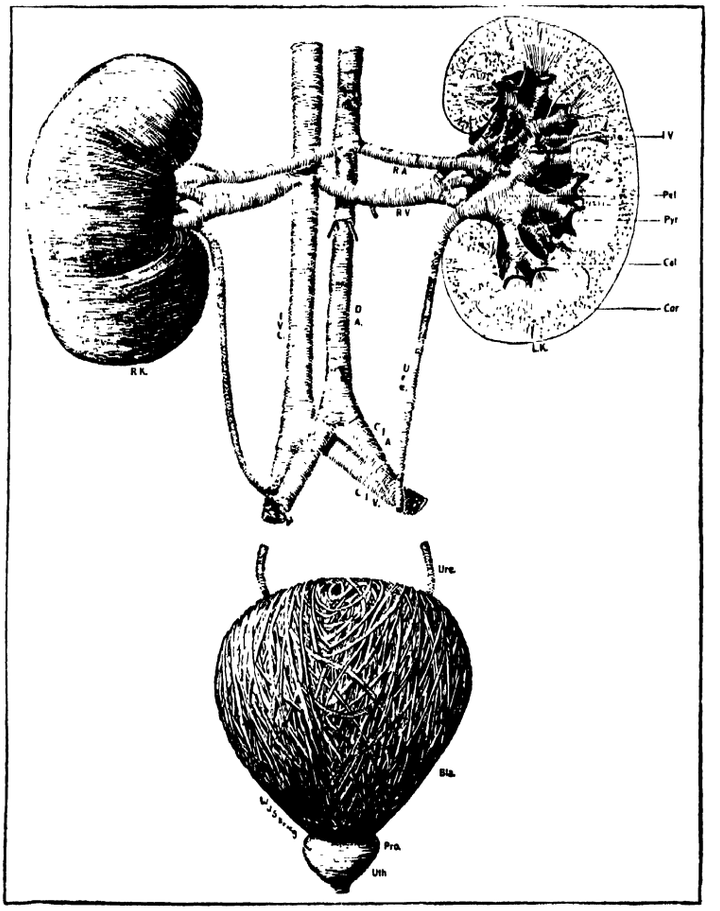


FIG. 1. HUMAN KIDNEY WITH THE BLOOD VESSELS, THE BLADDER, AND THE PROSTATE (ANTERIORLY)

Bla., *bladder;* Cal., *calyx;* C.I.A., *common iliac artery;* C.I.V., *common iliac vein;* Cor., *cortex;* D.A., *descending aorta;* I.V., *interlobar vessels;* I.V.C., *inferior vena cava;* L.K., *left kidney;* Pel., *pelvis;* Pro., *prostate;* Pyr., *pyramid;* R.A., *renal artery;* R.K., *right kidney;* R.V., *renal vein;* Ure., *ureter;* Uth., *urethra*

it to Manser Biset. With modern parks and public buildings, Kidderminster is a pleasant town; its chief antiquity is the Early English and Decorated All Saints' Church with a handsome, embattled tower,

and the tomb of Richard Baxter, the Puritan divine. Sir Rowland Hill (d. 1879), originator of penny postage, was a native of Kidderminster. Early manufacture of woolens was replaced in 1735 by the famed carpets which later were supplemented by the weaving of Brussels carpets. Pop. 1921, 27,118; 1931, 28,914.

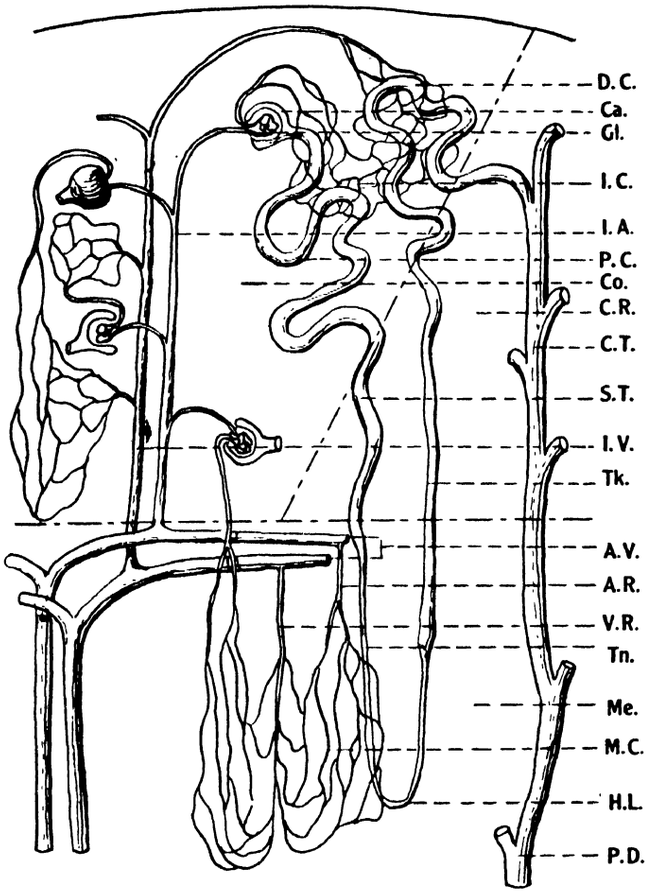


FIG. 2. DIAGRAM TO SHOW THE SEGMENTS OF THE URINARY TUBULE, ITS RELATION TO THE PARTS OF THE KIDNEY, AND TO THE CIRCULATION

A.R., *arteria recta;* A.V., *arcuate vessels;* Ca., *Bowman's capsule;* Co., *cortex;* C.R., *cortical ray;* C.T., *collecting tubule;* D.C., *distal convoluted tubule;* Gl., *glomerulus;* H.L., *Henle's loop;* I.A., *interlobular artery;* I.C., *interlobular capillaries;* I.V., *interlobular vein;* M.C., *medullary capillaries;* Me., *medulla;* P.C., *proximal convoluted tubule;* P.D., *papillary duct;* S.T., *spiral tubule;* Tk., *thick segment of Henle's loop;* Tn., *thin segment of Henle's loop;* V.R., *vena recta*

KIDNEY. The kidney is a bean-shaped organ about four inches in length lying in the back of the abdomen with its long axis vertically, whose function is to secrete urine. Its hilus is directed toward the midline and affords entry to the renal artery (*R.A.*) and vein (*R.V.*) and the ureter. On reaching the hilus, the ureter expands into the renal pelvis (*Pel.*), and divides into a number of calyces (*Cal.*), each of which fits over a papilla (*Pa.*). Into the papilla empty a number of papillary ducts (Fig. 2, *P.D.*). A papillary duct is formed by the union of a number of collecting tubules (*C.T.*) within the pyramid (Fig. 1, *Pyr.*).

The urine is formed in the urinary tubule, lying chiefly in the cortex (*Co.*) of the kidney. At its blind end it is expanded into a capsule (Fig. 2, Ca.), one wall of which is pushed in, forming a double-walled cup. A knot of fine blood vessels, the glomerulus (*Gl.*) fits into this cup. The blood vessels are branches of the interlobular artery (*I.A.*), which is in turn derived from an arcuate vessel (*A.V.*). On leaving the capsule, the urine passes into the proximal convoluted tubule (*P.C.*), lined with cuboidal cells which may aid in the secretion of urine. Then it passes successively into Henle's loop (*H.L.*), the distal convoluted tubule (*D.C.*), and into the collecting tubule. *See also* EXCRETION; URINARY SYSTEM. W. J. S. K.

KIDNEY, DISEASES OF. The most common disturbances of the kidney are acute and chronic inflammations known as acute and chronic NEPHRITIS. Acute nephritis may occur at any age, but is seen more often in children and young adults. It often follows the acute infectious diseases and tonsillitis. Poisoning with turpentine, mercuric chloride, arsenic and lead will produce it. The symptoms of fever, pain in the back and vomiting appear suddenly. The most important symptom is diminution of the quantity of urine which is found to contain albumin and blood.

Treatment consists of rest in bed, restriction of diet and the giving of alkalies and fluids.

Chronic nephritis may follow acute inflammation, may result from hardening of the arteries in the kidney with decreased blood supply to the kidney tissue, but in some cases the cause is not exactly understood. Hygienic errors, such as overeating or the habitual use of alcohol, may be contributory causes for the condition.

There are in general two types of chronic nephritis, parenchymatous and interstitial. In the former, the urine is found to be diminished in quantity and contains much albumen, casts and white and red blood cells. Water and salts are retained in the body with the development of edema or dropsy. In the interstitial type there is increased frequency as well as quantity of urine. The urine contains but limited quantities of those substances normally excreted in it. There may also be traces of albumin and a few casts.

Pyelitis, or inflammation of the pelvis of the kidney, is another common disorder. The colon bacillus, as well as staphylococcus and streptococcus, may be the causative organisms. The symptoms consist of pain and burning on urination, fever and vomiting. The usual treatment consists in increasing the fluid intake and the giving of alkalies. If this does not produce a cure, in some instances the urine is made acid by giving sodium acid phosphate and hexamethylene amine is administered.

Various kidney malformations may be present at birth. There may be extra kidneys or one kidney may be absent. The two kidneys may be fused.

Occasionally the kidney may become movable. This often produces no symptoms. Occasionally there may be dragging pain in the back. The treatment consists in the wearing of an abdominal support in mild cases and operation in severe cases when indicated.

Another more rare disorder of the kidney is paroxysmal hemoglobinuria, in which there is fever, chills

and the appearance of blood in the urine. The exact cause is not known.

Stones may form in the kidney producing acute attacks of pain with blood and pus in the urine. Treatment is usually operative, although small stones may pass spontaneously.

Tumors may form in the kidneys, the most important of which is known as hypernephroma. They grow rapidly, blood appears in the urine and there is emaciation. With early diagnosis the tumor may be successfully removed. The percentage of recovery, however, is small. Cysts also form in the kidneys.

Suppurative processes may occur in the connective tissue around the kidney, producing the so-called perinephritic abscess. Tuberculous infection of the kidney also occurs. *See also* CALCULI; DIURETICS; TUMORS; URINARY SYSTEM; UROLOGY. W. I. F.

KIDNEYS: As a Food. Kidneys from veal, beef, lamb and pork are among the nutritious and economical but less popular cuts of meat. Like liver, kidney is an excellent source of iron, copper and protein, and an efficient factor in the construction of red blood corpuscles. It usually costs much less than liver. It is a good source of vitamins A, B and G. *See also* VITAMINS IN FOODS.

KIEL, the second largest town of the Prussian province of Schleswig-Holstein, seat of the Baltic Naval Station and of a university founded 1665; located at the north Baltic end of the Kiel Canal. It has been of no importance as a German naval port since 1918. The fortifications have been demolished. Yachting is still a favorite sport, although the glamor of the pre-war "Kieler Woche" has diminished. On the market place is the old rathaus of 1596 and St. Nicholas' Church, a late-Gothic brick edifice built in 1240 and later remodeled. The former castle of the dukes of Holstein-Gottorp was built at the end of the 16th century. The Haulow Museum, the Schleswig-Holstein Museum and the art gallery contain characteristic works of art and other objects from early times. Pop. 1925, 213,881.

KIEL CANAL, or **KAISER WILHELM CANAL,** in Germany, linking the mouth of the Elbe on the North Sea with Kiel on the Baltic and covering a distance of 60 mi. In 1877 construction of the canal was begun, partly opened in 1891, and finally completed 4 years later. It permitted the passage of large sea-going steamers and had the following dimensions: width at water level, 220 ft.; width at bottom, 85 ft.; and depth, 28 ft. The locks were 492 ft. long, 82 ft. wide and 32 ft. deep. With the appearance of large warships Germany, wishing full strategic benefits from this canal, was forced to broaden the cross-sectional proportions in 1908. These alterations, completed 6 years later, provided the waterway with a width of 335 ft. at water-level and 144 ft. at bottom and a depth of 36 ft. The locks, 47½ ft. wide, have an available length, 1,082 ft. greater than those on the Panama. Two of the largest ocean liners can pass each other in the canal. The canal, in effecting an inland passage between the naval bases at Wilhelmshafen on the North Sea and Kiel, is strategically significant, since in case of need, the forces at one base can readily support those at the other. The entire German naval power can be quickly mobilized, either in the Baltic or in the North Sea. During the World War the canal played an important rôle in German naval warfare. The total cost of the Kiel Canal was over $55,000,000.

KIELCE, capital of the Polish voievodship of the same name, situated in a hilly region in the neighborhood of the Swietokrzyskie Mountains. Kielce was founded by Bishop Gideon of Cracow in 1173, and is the residence of a bishop. The town has a cathedral, built in the 14th century in the Gothic and reconstructed later on the Baroque style. The authorities of the voievodship reside in a fine Baroque palace, which was until the end of the 18th century the residence of the Bishop of Cracow. Its reception rooms still contain old paintings and frescoes. There are two advanced schools, a theological seminary, and a nunnery with an ancient statue of St. Barbara. Quarries of the so-called Kielce marbles are nearby, and also copper, lead and iron mines. Among other industries the chief ones are cotton printing, cement making and hemp spinning. Est. pop. 1930, 50,000.

KIELLAND, ALEXANDER LANGE (1849-1906), Norwegian novelist, was born at Stavanger, Feb. 18, 1849. He studied and practiced law for a time. His first literary work was *Novelettes.* For 12 years Kielland wrote novels and plays which placed him in the front rank of Norwegian writers. Then he stopped writing because he felt that he could no longer maintain the standard he had set. Among his novels are *Garman & Worse, Skipper Worse, Snow, Poison, Fortuna* and *Jacob.* His most successful plays are *Betty's Guardian* and *The Professor.* He died at Bergen, Apr. 6, 1906.

KIERAN, JAMES MICHAEL (1863-), American educator, was born in New York City, Aug. 23, 1863. He was graduated from the College of New York, 1882; from St. Francis Xavier College, New York City, 1887; and studied at Columbia University. He was teacher and principal of schools in New York City, 1883-1904, then joined the faculty of Hunter College as professor of philosophy and education. He became dean of the college in 1927, acting president in 1928, and president in 1929.

KIEV, a leading city and river port of the Ukrainian S.S.R., and the third largest city of Russia. Situated on the right bank of the Dnieper River, its area embraces a low valley, table-lands and hills, with many-hued domes and spires contributing to its picturesqueness. Kiev is the seat of Ukrainian culture and the commercial heart of the Ukraine; the Contract Fair makes it a leading center of exchange. Machine-making factories, railroad shops, beet-sugar refineries, and a considerable number of minor industries contribute to its prosperity. Steamship lines, railroads and air lines lead to all parts of the Soviet Union.

The ruined Golden Gate, constructed in 1037, is one of the sights of the city; the most notable of

many others are the striking 19-domed Byzantine Cathedral of St. Sophia, the ancient Lavra monastery, oldest and most important in all Russia, and the Cave Monastery. Museums of ethnography, history and zoology rank high in scientific importance. Pop. 1926, 513,637.

History. Although Kiev had been a trading center before the Viking penetration into Southern Russia, the historical principality of Kiev, which became the chief center of medieval Russian civilization during the 11th and 12th centuries, was founded by Scandinavian warrior merchants. These had been attracted by the prospect of trade with Byzantium and the Near East and had pushed down the Dnieper about 800 and established their authority over the neighboring Eastern Slavic tribes. Gradually extending their control over the Slavs resident on both sides of the river, the princes of Kiev rapidly built up a prosperous state which entered into commercial and political relations with Byzantium, from which Vladimir I adopted Christianity in 988. Under his son Yaroslov the Wise the principality attained a high level of material well-being and culture. Strife among Yaroslav's successors undermined the structure of the state, which was also continuously menaced during the 12th century by the nomads of the steppes until it was reduced to servitude by the Tatars, who sacked Kiev in 1240. For over a century prior to the Tatar conquest, Kiev had been losing in political prestige both to Novgorod and to the newer principalities of the Rostov-Suzdal area. After the incursion of the Tatars, they dominated the civilization of the Eastern Slavs for two and a half centuries until the rise of Moscow, the princes of which, beginning with Ivan Kalita, 1328-41, gradually threw off the Tatar yoke and made their principality the nucleus of the modern Russian state.

With the general industrialization of the city in the 19th century a national movement gradually materialized. Between 1917 and 1920 fighting was almost constant as control of the territory fluctuated between Germans, Whites and Reds.

KIKINDA. *See* VELIKA KIKINDA.

KILCOLMAN CASTLE, the ruins of a solitary castle once the home of EDMUND SPENSER, near Doneraile, County Cork, Ireland. Spenser was appointed Lord Deputy of Ireland in 1580, and was living in the small, gloomy tower of Kilcolman Castle till about 1588. The title to the castle and its extensive lands was granted him in 1591, and it was there that much of the FAERIE QUEENE was written. The castle, situated at the edge of a small lake, was sacked and burned by Irish rebels in 1598.

KILIMANJARO, a mountain of East Africa, 200 mi. inland from Mombasa, Kenya, standing between Lake Victoria and the coast. It is within the northern border of Tanganyika Territory and forms the culminating point of the otherwise low Usambara range which runs inland from near Tanga, Tanganyika. Kilimanjaro is an extinct volcano with its summit covered by glaciers and snow. It forms an immense and almost isolated mass rising to a height of 19,328 ft., the highest point of Africa. The crater is 650 ft. deep and 6,500 ft. in diameter. In 1848 a member of the Church Missionary Society discovered the mountain.

KILIWE, a very small band of Indians speaking a Yuman dialect and living near Santo Tomas Mission, northwest of Santa Borja, Lower California.

KILKENNY, a county of the Irish Free State, in the province of Leinster, bounded by counties Leix, Carlow, Wexford, Waterford and Tipperary, and covering about 511,700 acres. To northward there are important coal fields. The chief and partially navigable rivers are the Barrow, Nore and Suir. Originally a part of the Kingdom of Ossory of which era many hill forts and dolmens survive, Kilkenny was made a county by King John. There are many antiquities, including remains of churches, monasteries and fortifications. Having a relatively mild climate and excellent soil, Kilkenny is prosperous agriculturally. Among the county's industries are tanning, flour milling and brewing. Pop. 1926, 70,990.

KILKENNY CATS, in an Irish legend, two cats which fought until only their tails were left. The story probably refers to the boundary wars which raged between Kilkenny and Irishtown from the 14th to the 17th century, to the impoverishment of both communities. Or it may have originated when a troop of Hessian soldiers quartered in Kilkenny between 1798 and 1803, tied two cats together by the tails and, throwing the struggling animals over a clothes-line, watched them fight. When an officer approached one day, the soldiers had to cut through the tails of two cats to free them, explaining to their superior that the cats had devoured each other except for their tails.

KILLARNEY, a market town and resort of County Kerry, Irish Free State, about 185 mi. southwest of Dublin, in a countryside celebrated for its woods, mountains, waterfalls and three great lakes. The Upper Lake is overlooked by lofty Eagle's Nest; the ivy-hung ruins of Muckrose Abbey, c. 1440, face upon the Middle Lake. The Lower Lake has the remains of Ross Castle and some thirty picturesque islands. To-day Killarney has become a tourist center, and also markets fish abundant in the adjacent rivers. Pop. 1926, 5,328. *See* KILLARNEY, LAKES OF.

KILLARNEY, LAKES OF, three beautiful lakes in the county of Kerry, Irish Free State. The largest is Lough Leane, measuring 5 by 2½ mi.; immediately above it is Muchross Lough, 2 mi. long and 1 mi. wide; and farthest north is the Upper Lake, the most beautiful of the three, measuring 2½ by ¾ mi. Above the lakes on the west, tower the MacGillicuddy Reeks, the wildest and loftiest mountains in Ireland. The peculiar charm of the region lies in the richness and color of the foliage on the banks of the lakes and on the many islets which dot their surface. Masses of lilies thrive in their waters. The River Laune drains the lakes into Dingle Bay.

KILLDEER (*Oxyechus vociferus*), one of the best known of North America plovers frequenting mead-

ows, pastures and open prairies, usually in the vicinity of water. It is about 10½ in. long, with a rather long tail, grayish brown upperparts, white underparts, a white ring about the neck and two black bands on the chest. Breeding almost throughout temperate North America it migrates southward in winter, some to Central and South America and the West Indies while others remain as far north as New Jersey. In habit it is noisy and restless, uttering a peculiar ringing "kill-dee, kill-dee," which becomes almost incessant at breeding time. It runs rapidly, taking to swift flight if alarmed. In a sparsely lined nest made in a hollow in the ground it lays four spotted buffy eggs.

KILLIFISH, a small fish belonging to a numerous family (*Poeciliidae*), found in streams and ponds of North America, Europe, and Asia. Most of these fishes are oviparous, but some are viviparous. Those of the common American genus (*Fundulus*) are characterized by their small mouths, equipped with pointed teeth, broad, scaly heads and compressed, elongated, scaly bodies. In one of the larger killifishes (*F. majalis*), about 6 in. long, the male differs from the female in being marked with transverse instead of longitudinal black bars. Another well known killifish (*F. heteroclitus*), also called mudfish or mummichog, buries itself in the mud and feeds on small water animals. Many of these fish are used for bait and some living near the surface are called top minnows.

KILLIGREW, THOMAS (1612-83), English dramatist, was born in Lothbury, London, on Feb. 7, 1612. When he was 21 he became a page of Charles I and was closely associated with court life. He traveled on the Continent after the execution of his king, but returned and received offices under Charles II. Killigrew had already written tragi-comedies, and continued his activities in the theater by erecting his own playhouse and forming a company of players. He was the author of many plays, among which are *Claracilla* and *The Parson's Wedding*. Killigrew was famous for his wit. He died at Whitehall, London, Mar. 19, 1683.

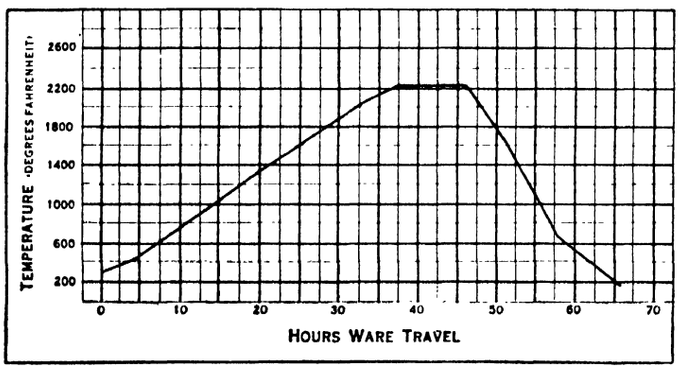
KILL VAN KULL BRIDGE, also known as the Bayonne Bridge, the longest arch span bridge in the world, extending across the Kill van Kull from Port Richmond, Staten Island, N.Y., to Bayonne, N.J. Its channel span is 1,675 ft., its height above high water, 150 ft.

KILMARNOCK, a municipal burgh of Ayrshire, Scotland, lying on Kilmarnock Water, 24 mi. southwest of Glasgow. Although mainly a manufacturing town there are many modern public buildings, numerous schools, and two excellent parks. The first edition of Robert Burns's poems was printed at Kilmarnock. The woolen industry, which became prominent in the 17th century, persists in the making of shawls and tweeds. The district around Kilmarnock produces many minerals, iron being important among other industries of the town. Pop. 1921, 35,747; 1931, 38,099.

KILMER, JOYCE (1886-1918), American poet, was born in New Brunswick, N.J., Dec. 6, 1886. He was educated at Rutgers College and at Columbia University. He took up journalism as a career and from 1913 to 1918 was on the staff of the New York *Times,* while he contributed both prose and poetry to magazines. His poetry was collected in *Summer of Love, Trees and Other Poems,* and *Main Street and Other Poems.* His *Circus and Other Essays* was published in 1916 and *Literature in the Making* in the following year. Soon after the United States entered the World War Kilmer joined the 165th Infantry as a private and was killed in action near Seringes, France, July 30, 1918.

KILNS, the places for burning, baking or drying; in ceramics, the places where the product is heat treated to make it commercial.

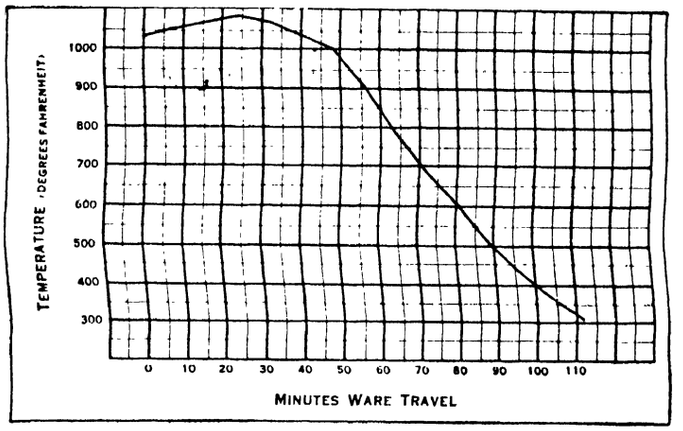
Ceramic Kilns. There are numerous types of kilns using temperatures ranging from 800 to 3000° F. A kiln to attain commercial success must have the following advantages: ease in the control of the internal atmosphere and precision in the regulation of fuel pressure and kiln temperature; uniformly-fired high-quality products in the minimum firing time and negligible rejects; maximum fuel economy; low maintenance cost. Generally speaking all kilns are made of firebrick, refractories and red brick together with some steel and insulating material. Whether the kiln is periodic or continuous, it is necessary to have the ware so set that the heat will penetrate all parts at all times. The method of setting is usually determined by experiment. A definite firing and cooling schedule must be followed and a different curve maintained for each kind of clay and each type of kiln. A general temperature rise of 30° F. per hour up to 1250° F., a rise of 60° F. per hour from 1250° F. to 2300° F., a burning-soaking period of 10 hours at 2300° F., and a cooling rate of 100° F. per hour from 2300° F. down to 100° F. is a typical firing schedule.



TYPICAL TIME-TEMPERATURE CURVE FOR CONTINUOUS KILN BURNING FIRE BRICK

Fuel fired kilns are used most extensively for bisque and gloss firing and also for decorating. Electric kilns at lower temperatures serve excellently for decorating. Heat treatment of some ceramic wares, especially glass, is considerably benefited by allowing the products of combustion to come in contact with the finished article during the annealing and cooling process of the kiln. A continuous kiln for annealing

glass is called a lehr. Lehr temperatures are lower than clay kiln temperatures, and usually vary between 900° F. and 1150° F. in the annealing range. Cooling, after 700° F. is reached (the critical point for most glasses), can be as rapid as possible without damage to the ware. A general annealing schedule, depending on the weight, size and shape of the glassware, will vary from 2° F. per minute to 20° F. per minute.



TYPICAL TIME-TEMPERATURE CURVE FOR CONTINUOUS LEHR ANNEALING GLASS CONTAINERS

Controlled overhead heat, together with underconveyor heat is the best for removing mechanical and thermal strains and stresses from the product or putting them into it, whether it be one side of a sheet of glass or a glass container. Electric heat has revolutionized annealing in the plate glass manufacturing process, with rollers serving as the conveying medium in the continuous and semi-continuous methods. Combination combustion fuel and electric lehrs serve ideally for decorating lehrs. The electric heat serves as a good controlling medium. As in the typical ceramic kiln and dryer, the decorating lehr receives the ware or glass around room temperatures. It is extremely necessary that continuous kilns and lehrs be designed for ruggedness and sturdiness, because interrupted duty is costly in the necessary heat treatment.

J. E. F.

Calcining Kilns, furnaces used to heat solids undergoing CALCINATION. Two of the most important types of kilns are the vertical shaft and the rotary. In the shaft kiln, the solid to be heated is charged to the top of the kiln, and passes down through the shaft until it is withdrawn at the bottom. Unburnt or hot partially burnt, fuel gases are admitted near the bottom of the kiln, complete their combustion, and supply heat to the solid material. The gases pass up through the kiln, are cooled by the material and leave at the top. Air for the combustion enters at the bottom of the kiln.

The rotary kiln is a long cylinder, mounted nearly horizontally, and lined with refractory brick. It is rotated slowly about its axis. The solid is charged at the higher end, and passes through the kiln under the influence of the rotation and slight slant of the cylinder. Fuel is forced in at the lower end and the combustion gases pass through the kiln in the opposite direction to the solid. *See also* DRYERS, WOOD PRODUCT; DRYING AND DRYING EQUIPMENT. W. L. McC.

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KILO-CALORIE, INTERNATIONAL. *See* CALORIE.

KILOCYCLE, a unit for FREQUENCIES, comprising 1,000 cycles per sec. It is commonly used to express assignments in the broadcasting and other bands of radio waves. *See also* RADIO COMMUNICATION.

KILOGRAM, a unit of weight equal to 1,000 GRAMS. *See* METRIC SYSTEM.

KILOGRAM CALORIE. *See* CALORIE.

KILOMETER, a unit of length equal to 1,000 meters. *See* METRIC SYSTEM.

KILOWATT, a practical unit of power equal to 1,000 watts or 1.341 horsepower. *See* ELECTRICAL UNITS.

KILOWATT-HOUR, a unit of electrical energy, signifying the WORK done, or the energy expended, by an agency developing power at the rate of one KILOWATT and operating for one hour. The kilowatt-hour is equivalent to 1,000 WATT-hours or 1.341 HORSE-POWER-hours, approximately. The kilowatt-hour is very often confused with the kilowatt which is a power unit. A 100-watt electric lamp consumes electrical energy at the rate of 100 watts, or 100 JOULES per sec. If operated for ten hours, the electrical energy consumed is one kilowatt-hour.

KIM, the popular tale by RUDYARD KIPLING of an Irish waif in India; published 1901. Kimball O'Hara, or Kim, is left an orphan at an early age, and grows up precociously in the native quarter of Lahore. With the old Lama of Tibet he wanders over India, gathering much wisdom, learning all that the seamy side of Anglo-Indian society has to teach, until he is at last adopted by his father's former regiment, sent to school, and, finally, because of his special knowledge, placed in the Indian Secret Service.

KIMBERLEY, a city of the CAPE OF GOOD HOPE, Union of South Africa, in the district of Griqualand West. It is built on a plain and has broad streets. The discovery of diamonds near Kimberley in 1867 brought a rush of settlers. For many years the diamond workings took the form of deep excavations, but underground mining now prevails. During the BOER WAR the town was besieged by the Boers for 126 days until relieved by the British, Feb. 15, 1900. Pop. 1921, 39,702, including 18,288 Europeans; 1926, 17,268, Europeans, 1931, 18,471.

KIMBERLITE, a mica PERIDOTITE rock, consisting essentially of OLIVINE and BIOTITE, with such accessory minerals as ilmenite, GARNET, PYROXENE and GRAPHITE. It is the so-called "BLUE GROUND" in which the diamonds of South Africa occur. *See also* DIAMOND.

KIMHI, the name of a Jewish family of scholars whose first members lived in southern Spain and the Provence in the 11th and 12th centuries. The three most important members of the family were Joseph and his two sons, Moses and David.

Joseph Ben Isaac Kimhi, surnamed Maistre Petit, was born in southern Spain about 1105 and died about 1170. He was a grammarian, lexicographer, exegete, poet, apologetic writer and translator. In consequence of the religious persecutions of the Almohades he left his native country and settled in Narbonne, Provence, where he was active as a teacher. In his grammatical works, *Sefer Zikkaron,* Berlin, 1888, and *Sefer ha-Gallui,* Berlin, 1887, while he is on the whole dependent on Hayyuj, he is nevertheless original in minor points. All these were adopted by all later writers on the subject. His grammatical works are interspersed with exegetical and lexicographical remarks, the latter mostly based on the works of IBN JANAH.

Of his exegetical works but little has been preserved. His commentaries on the Pentateuch and the Prophets are lost. Of his commentaries on the Hagiographa there remain one on Canticles, still unpublished; one on Proverbs, published under the title of *Sefer Huqqah,* Breslau, 1868; and a fragmentary commentary on Job, published by Schwarz in his *Tiqwat Enosh,* Berlin, 1868. He keeps to a literal interpretation, is short and terse in his explanations, and eclectic in his method. Of his poetical works only a few liturgical compositions have been preserved. While they are beautiful in form and elegant in language they cannot compare in their spiritual value with those of his illustrious contemporaries. He turned Ibn Gabirol's *Mibhar ha-Peninim* into metrical verse under the name of *Shekel ha-kodesh.* His translation of Bahya ibn Pakuda's *Hobot ha-Lebabot* has been lost. At the request of one of his pupils he wrote his *Sefer ha-Berit,* an apologetic work in defense of Judaism, of which a fragment was published in *Milhemet Hobah,* Constantinople, 1710.

Moses Ben Isaac Kimhi, teacher of his younger brother, David Kimhi, exegete and grammarian, died about 1190. Of his exegetical works his commentaries on Proverbs, Ezra and Nehemiah are printed in the rabbinic Bibles under the name of Abraham ibn Ezra. A short commentary on Job appeared in Schwarz's *Tiqwat Enosh,* Berlin, 1868. He wrote two elementary Hebrew grammars: *Sekel Tob,* published in *Revue des Etudes Juives,* xxvii.212, xxix.-100, and the first concise methodical text-book on Hebrew grammar, *Mahalak Shebile ha-Da'at.* At the time of the Renaissance the latter was commented on by Elias Levita and translated into Latin by Sebastian Muenster. It served as a convenient text-book for the study of Hebrew by Christians.

David Ben Joseph Kimhi (1160-1235), grammarian, lexicographer, exegete and controversialist, was born in Narbonne, Provence, in 1160, and died there in 1235. His most important work is his *Miklol,* in two parts, a Hebrew grammar and a dictionary. He copiously excerpted his predecessors, but added considerably of his own, especially in his dictionary. He had the power of systematization and of lucid exposition, and his work was accepted as standard by later generations.

He is said to have commented on the entire Bible; but only his commentaries on Genesis, the Prophets, the Psalms and Chronicles have survived. His exegesis is mostly rational; but here and there he introduces philosophy. His commentary on the Psalms is especially noted for his polemics against Christianity. These polemics have been deleted from the text by the censors of the Middle Ages, and were therefore printed separately under the title of *Teshubot la-Nozerim.* Numerous translations were made of his commentaries by Christians, and his influence is evident from every page of the English Bible. In the quarrel between the Maimonists and anti-Maimonists he took an active part, defending Maimonides.

C. L.

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KINCK, HANS ERNST (1865-), Norwegian novelist and dramatist, was born at Loppen, in Finmarken, Oct. 11, 1865. He grew up in Sätesdal and Hardanger, and the peasant characters in his writings speak these dialects. His best known novels are *Herman Ek, Emigrants* and *The Avalanche.* His collections of short stories include *Bats' Wings, From Seat to Mountain Ridge, When Love Dies* and *The Church Is Burning.* Among his dramas, which are chiefly set in Italy, are *Toward Carnival Time,* with Machiavelli the central character, and *The Last Guest,* a tragedy dealing with Aretino's old age. Another notable work of Kinck's is *The Drover,* a long dramatic poem.

KINDERGARTEN, a school for children from four or five to six or seven, this varying in different countries and even in different sections of the same country. The original kindergartens were developed on the theories of a student of JOHANN PESTALOZZI, FRIEDRICH FROEBEL, who stressed the importance of physical, mental and moral training of small children through special play activities. The kindergarten of to-day is being developed along lines radically different from Froebel's system. In the early days, the basis for the work was entirely philosophical. The emphasis now is on the development of the child in accordance with psychological studies.

The first kindergarten in America, which far outstrips other nations in kindergarten development, was opened in 1860 in Boston by Miss Elizabeth Peabody. Other schools were soon opened in New York; Hoboken, N.J.; San Francisco; Chicago; Louisville, Ky.; Louisville, Mo.; Pittsburg and Milwaukee. By the early '80s there were kindergartens in most of the large cities. Started originally as private enterprises,

kindergartens were early incorporated in the public school system, St. Louis, Mo., being the pioneer, 1873. To-day the public kindergartens outnumber the private schools. Of 749,946 students enrolled in 1928, 555,070 were in public schools. Though there has been a growing recognition of the value of kindergarten training, still only about one-eighth of the children in the United States from four to six are enrolled in these classes. Investigation shows that a child who has had even one year in kindergarten excels in scholarship, social leadership and general intelligence.

M. R.

See N. C. Vandewalker, *Kindergartens in American Education*, 1908.

KINEMATICS. *See* MECHANICS.

KINEMATOGRAPHY. *See* MOTION PICTURES.

KINETIC ENERGY. *See* ENERGY.

KINETICS. *See* MECHANICS.

KINETIC THEORY. All matter is made up of MOLECULES which are not in actual contact with each other. These are in constant motion. The higher the temperature, the greater the average kinetic energy of this *thermal agitation* (*see* AGITATION, THERMAL). In solids, the molecules occupy relatively fixed positions about which they vibrate. In liquids they possess greater freedom of motion, as shown by the phenomena of DIFFUSION. In gases, the molecules are so far apart that the forces of mutual attraction (*see* COHESION), which play so prominent a part in liquids and solids, have little influence on their motion.

The kinetic theory has furnished a mechanical picture which serves to explain approximately the properties and behavior of actual gases as well as to define in detail a *perfect,* or *ideal,* gas. Any mechanical theory of gases must explain certain well-known facts. For example, a gas confined in a vessel exerts a total force on the walls which is much greater than its own weight. Thus, consider a liter of hydrogen, at a temperature of 0° C. and a pressure of one atmosphere, in a cubical box 10 cm. on an edge. The gas exerts a pressure of 1,033.6 grams per sq. cm. on the walls. The cube has six faces. Hence, the total force exerted is 6 x 10 x 10 x 1,033.6 grams, or over 1,364 lbs. Yet, the gas weighs less than 0.09 gram, or about 0.0032 oz. That is, the total force exerted by the gas on the walls of the box is almost seven million times its own weight.

In the 18th century, BERNOULLI showed that the pressure of gases can be explained if the molecules are in constant motion at high velocity. The bombardment of the walls by these very rapidly moving particles produces the pressure, just as water from the nozzle of a hose exerts a force which depends upon the speed of the individual drops as well as on their weight.

Other facts that must be explained are BOYLE'S LAW, CHARLES' LAW, Avogadro's Law (*see* AVOGADRO'S HYPOTHESIS) and DALTON'S LAW. The kinetic theory of gases meets these requirements by mathematical deductions from certain postulates, which include the following: 1. Except during collisions, the molecules are perfectly free. Hence, they move at uniform speed in straight lines from one collision to the next. 2. The time occupied by a collision is negligibly small compared to the time between collisions. 3. The diameters of the molecules are negligibly small compared to their "free paths." 4. The collisions are elastic. Stated in less technical terms, the molecules of gas are pictured as infinitesimal, perfectly elastic spheres which rebound from each other and from the walls without loss of energy. These spheres are so small that if their motion stopped, their total volume would be too small to be noticed.

The pressure, p, exerted by a gas is given by the equation $p = \frac{1}{3} N M V^2$ (1) where N is Avogadro's constant, i.e., the number of molecules per cu. cm., M the mass of an individual molecule and V^2 the average of the squares of the molecular velocities (not the square of the average velocity).

The product, $N M$, is the mass per cu. cm. of the gas, i.e., its DENSITY, d. Hence equation (1) may be written $p = \frac{1}{3} V^2 d$ (2). MAXWELL showed that, for two different gases at the same temperature, the average kinetic energy per molecule of the first is equal to the average kinetic energy per molecule of the second. Hence, if the temperature of the gas remains constant, V^2 must be constant, since M cannot change. Hence, equation (2) indicates that at constant temperature the density of a gas is proportional to the pressure. This is one form in which Boyle's Law may be stated.

It can also be shown that Avogadro's Law and Dalton's Law follow directly from equation (1). Charles' Law, that at constant volume the pressure varies directly as the absolute temperature (*see* ABSOLUTE TEMPERATURE SCALE), also is a consequence of equation (1), for the absolute temperature is a measure of the mean molecular kinetic energy, $\frac{1}{2} M V^2$.

Although it is impossible to observe any single molecule, to weigh it or to measure its velocity, the mean square velocity can be computed from equation (2). Besides V^2, this equation involves only the pressure and the density, both of which can be measured directly. Hence V^2 and V can be found. Thus, at 0° C., the mean velocity of the hydrogen molecule is 1,843 m. per sec., or over 66 mi. per min. The corresponding speeds for the oxygen and nitrogen molecules are 461 m. per sec. and 492 m. per sec.

No actual gas satisfies the conditions of the kinetic theory exactly. The conclusions deduced directly from it define the properties of an *ideal,* or *perfect,* gas. However, the results of the JOULE-THOMSON EFFECT make it possible to correct these calculations to make them apply to any actual gas.

One of the most beautiful confirmations of the kinetic theory is given by the phenomena of the BROWNIAN MOVEMENTS.

W. W. S.

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KING, BASIL (1859-1928), Canadian novelist whose real name was William Benjamin, was born at

Charlottetown, Prince Edward Island, Feb. 26, 1859. He was educated at St. Peter's School and King's College, Windsor. His first novel, *Griselda,* appeared in 1900. He wrote many others, the most popular being *The Inner Shrine,* 1909, *The Street Called Straight,* 1912, and *The High Heart,* 1917. He settled in the United States and died in Cambridge, Mass., June 22, 1928.

KING, CLARENCE (1842-1901), American geologist, was born at Newport, R.I., Jan. 6, 1842, and graduated in 1862 at Yale. In 1863-66 he was a member of the California Geological Survey and with J. T. Gardiner made the first survey of the Yosemite Valley. From 1866 to 1872 he conducted the U.S. Army survey of the 40th parallel across the Rocky Mountains. By his knowledge of the mineral resources in this region he exposed in 1872 the swindlers who were selling stock in the "diamond mines" of Arizona. In 1879 he organized the first U.S. Geological Survey, and after 1881 was engaged as a mining engineer. He died at Phoenix, Ariz., Dec. 24, 1901.

KING, GRACE ELIZABETH (1852-1932), American author, was born at New Orleans, La., in 1852, and received her education there. She made a special study of the history and people of her city and her writings are based on this knowledge. The first to attract attention were *Creole Sketches* published in the *New Princeton Review* beginning in 1886 and continuing until they appeared in book form in 1888. Her other works include *Balcony Stories, History of Louisiana, Madame Girard,* and *La Dame de Sainte Hermine.* She died in New Orleans, Jan. 14, 1932.

KING, RUFUS (1755-1827), American political leader, was born on Mar. 24, 1755, at Scarborough, Me. He graduated in 1777 from Harvard. He began practicing law in 1780, and in 1784 was a delegate from Massachusetts in the Confederation Congress, where he introduced a resolution prohibiting slavery in the Northwest Territory. In 1787 he helped to frame the Constitution, having introduced the resolution in Congress endorsing the proposed Convention at Philadelphia. In the Convention he supported the large state faction. When a member of the United States Senate from New York in 1789-96, he became leader of the Federalists, and in 1795 President Washington appointed him minister to England where he remained until 1803. In 1804 and 1808 he was the Federalist candidate for Vice-President, and in 1816 was the Federalist candidate for President against Madison. He then served two more terms in the United States Senate, 1813-25, where he consistently supported Federalist principles. In the debates over the admission of Missouri he was strongly opposed to the extension of slavery into new territory. He died at Jamaica, L.I., on Apr. 29, 1827.

KING, WILLIAM LYON MACKENZIE (1874-), Canadian statesman and economist, was born at Kitchener, Ont., on Dec. 17, 1874. He studied at the universities of Toronto, Chicago and Harvard. From 1900 to 1908 he was deputy minister of labor in Canada, editor of the *Labor Gazette,* and did notable work on labor and immigration commissions. He was minister of labor in 1909-11. In 1914-17 he investigated industrial relations for the Rockefeller Foundation, and in 1918 published *Industry and Humanity.* In 1919 he became the leader of the Liberal party in Canada, succeeding SIR WILFRED LAURIER. When this faction came into power in 1921 he assumed the post of prime minister. He advocated a tariff for revenue and a program to promote Canadian nationalization. Out of office for two months in 1926, he was returned and served until 1930, when the Conservative party carried the elections.

KING, WILLIAM RUFUS (1786-1853), American statesman, was born in Sampson Co., N.C., on Apr. 6, 1786. He studied law at the University of North Carolina, and in 1810 was sent to Congress, where he joined Clay, Calhoun and others in supporting Madison's administrative policies. After serving as secretary to William Pinkney at Naples and St. Petersberg in 1816-18, he was elected in 1819 to the United States Senate from Alabama, and remained in the Senate until 1844, when he became minister to France. In this office he helped to persuade France to recognize the annexation of Texas. He was elected Vice-President in 1852 under President Franklin Pierce, but died in Dallas Co., Alabama, little more than a month after taking the oath of office in 1853.

KINGBIRD (*Tyrannus tyrannus*), a well-known American bird of the fly-catcher family, called also bee-bird and bee-martin. It is about 9 in. long, blackish slate color above and white below, with a white-tipped tail and a concealed orange spot in the head crest. The kingbird nests in the United States and Canada, chiefly east of the Rocky Mountains, and winters in Central and South America. Although often feeding upon bees, it subsists largely upon injurious insects, catching its prey by swift darts from a fixed perch on a fence or leafless branch. It builds a compact nest, usually at the end of a branch, laying 3 to 5 chestnut spotted, white eggs. The pugnacity with which it attacks all birds, regardless of size, coming within the neighborhood of its nest, has given rise to its common name. Other American species are the gray kingbird (*T. dominicensis*), of the southern states, and the Arkansas kingbird (*T. verticalis*) and Cassin's kingbird (*T. vociferans*), of the western states.

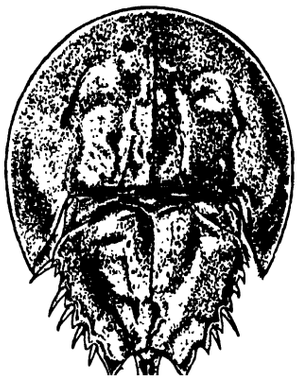


G. M. SUTTON. "BIRDS OF PA." J. HORACE MC FARLAND CO COPYRIGHT

KINGBIRD

KING CRAB, a popular name for members of an order (*Xiphosura*) of the arthropod class *Acerta.* There are four or five species found in the waters about Japan, China, the Molucca Islands, the Philippines and other parts of southeast Asia, and along the eastern coast of North America.

The body of the king crab is covered by a large horseshoe-shaped shell or carapace, beyond which projects a spinelike tail or telson which serves as a lever, a support in digging and as a weapon of defense. Its striking appearance has earned the animal a number of graphic popular names, among them horseshoe crab and casserole fish. Although its carapace gives it a superficial resemblance to the crabs, this creature is not a crab, nor even nearly related to them. It belongs to the same class as the spiders and scorpions. In past ages there flourished many other sea-dwelling animals belonging to this class, but the king crab is the only one that has survived.

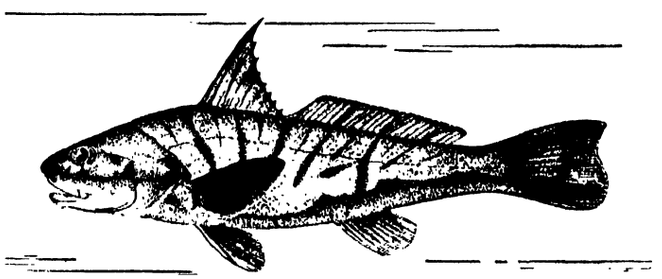


KING CRAB

The American species (*Xiphosura* or *Limulus polyphemus*) when grown is about two feet long. It digs in the sand and feeds on sea worms and shell fish. In the spring, when it comes into very shallow water to breed, the male is towed by the female. The eggs are buried between the tide marks and hatched by the sun. In the United States the flesh of the king crab is used for bait, for fertilizer or is fed to live stock, but in the Molucca Islands it is eaten by the natives.

KING EDWARD VII LAND. *See* ANTARCTICA.

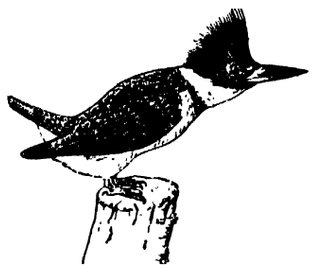
KINGFISH, a name applied to various spiny-rayed fishes, especially to the great kingfish or king mackerel (*Scomberomorus cavalla*), the southern kingfish or Carolina whiting (*Menticirrhus americanus*) and the



NORTHERN KINGFISH (*Menticirrhus saxatilis*), A NORTH ATLANTIC SPECIES

California kingfish or roncador (*Genyonemus lineatus*), all excellent food fishes. In 1929 the total catch and value of these fishes were as follows: great kingfish, 4,341,000 lbs., $227,000; southern kingfish, 1,427,000 lbs., $63,000; California kingfish, 476,000 lbs., $13,000, the two first named taken on the coast of the southern states, and the last named on the Pacific coast.

KINGFISHER, the name given to a numerous family (*Alcedinidæ*) of birds allied to the rollers and hornbills. There are about 200 species found practically throughout the world but most numerous in the Malay archipelago; of some 12 New World species all but one are almost tropical. They are birds of small or medium size, with compact bodies, large, crested heads, long straight bills and usually very short tails; their plumage is mostly greenish or bluish above and reddish variegated with white and black below. Most kingfishers are water-haunting birds and subsist chiefly upon fish and crustaceans, but some of the smaller woodland species are insectivorous. Usually solitary in habit, they sit motionless on a favorable perch on the lookout for their prey, which they capture with a swift dart, returning to the original spot to swallow it. Kingfishers breed in holes in trees or banks, laying white eggs. The belted kingfisher (*Megaceryle alcyon*) a handsome, alert, but rather shy bird, is found about streams and ponds almost throughout North America. It is somewhat more than a foot long, bluish-gray above spotted with white on the wings and tail with a white ring about the neck and pure white below, with a broad bluish band across the breast, the female having also a rusty brown band below the blue one.



BELTED KINGFISHER

KING GEORGE'S WAR, 1744-48, a conflict between the English and French colonies in America, incidental to the WAR OF THE SPANISH SUCCESSION in Europe. Indian raids upon the New England colonies were fewer and less catastrophic than those characterizing the two previous inter-colonial wars, KING WILLIAM'S WAR and QUEEN ANNE'S WAR. The chief event of the war was the successful attack, conceived and planned by Gov. Shirley of Massachusetts, upon Louisburg. Louisburg was a fortress, costing over $6,000,000 and requiring 25 years to construct, built by the French upon Cape Breton Island, which commands the entrance to the St. Lawrence River. Shirley persuaded the Massachusetts General Court to authorize the attack, and invite the cooperation of the other English colonies. Limited aid was given by Connecticut, New Hampshire and Rhode Island; of the 4,500 men finally mustered, Massachusetts furnished 3,300. William Pepperell, a merchant of Maine, was placed in command. Early in May, 1745, the expedition, transported by a nondescript fleet of Colonial vessels and augmented by four British men-of-war under Commodore Warren from the West Indies, appeared before Louisburg. A series of deadly cannonades disabled the island battery, and after a seven weeks' siege the fortress surrendered. It was a humiliating defeat for the French. A fleet of 65 vessels, despatched from France to recover Louisburg, accomplished nothing. The Treaty of Aix-la-Chapelle, 1748, returned Louisburg to France in exchange for

MADRAS, to the intense dissatisfaction of New England. The result was to further the growing conviction of the English colonies that they were being neglected and exploited by the mother country.

KING GEORGE V LAND. *See* ANTARCTICA.

KINGHIZ. *See* SOVIET CENTRAL ASIA.

KINGLAKE, ALEXANDER WILLIAM (1809-91), English historian, was born in Somersetshire, Aug. 5, 1809. He was educated at Eton and Cambridge and was called to the bar in 1837. His travels in the East he described in *Eothen,* published in 1844. This book made a great impression and ran into numerous editions. At the outbreak of the Crimean War he went to the Crimea where he remained until the fall of Sebastopol and later wrote *The Invasion of the Crimea* in 8 volumes (1863-87). He was a member of Parliament for Bridgewater (1857-68). His death occurred in London, Jan. 2, 1891.

KING LEAR, a deeply moving tragedy of ingratitude, by Shakespeare, written about 1605 and first produced in 1606, based on an old play, *The Chronicle Historie of King Leir,* and on the story of the legendary king in Geoffrey of Monmouth and Holinshed, in *The Mirror for Magistrates* and in Spenser's FAERIE QUEENE. The aged Lear, King of Britain, wishing to be freed from the duties of reigning, divides his kingdom between his two daughters Goneril and Regan, totally disowning his youngest daughter, Cordelia, because she has not been flattering as have the others. But Goneril, Regan and their husbands, in complete possession, soon show themselves heartlessly ungrateful, denying their father even the roof over his head, and drive him by their utter perfidy at last into madness. Perhaps the greatest single scene in English drama is that between the mad Lear and his Jester, as they wander in despair over the stormy heath at midnight. In the final act the noble Cordelia, now married to the king of France, comes to assist her father, but fails and is put to death. Aware too late of his mistake, Lear dies tragically over the body of the dead Cordelia.

KINGLET, a subfamily (*Regulinæ*) of very small song birds of the Old World warbler family (*Sylviidæ*), somewhat resembling the titmice in habit. There are seven species, two of which occur in North America. They are about 4 in. long, with soft plumage, olive-colored above and whitish below, and marked with a central orange, yellow or red spot on the crown. Active, energetic and friendly, the kinglets move about in parties, frequenting shrubberies and especially coniferous trees where they seek insect food. They build, usually in spruce trees, remarkably large and elegant nests in which are laid from 5 to 10 whitish, finely spotted eggs. The golden-crowned kinglet (*R. satrapa*), with an orange and black head patch, and the ruby-crowned kinglet (*Corthylio calendula*), with a bright red head patch, are found widely throughout North America. *See also* TITMOUSE.

KINGS, BOOKS OF, called I and II in the Authorized versions of the Old Testament, but termed III and IV in the Douay version, because the BOOKS OF SAMUEL are reckoned the earliest part of these writings. Originally in the Hebrew MSS. they formed one book. They relate the history of the Hebrew people from the last days of David to the captivity of Judah in Babylon, 597 B.C. Many modern scholars believe that the narratives were first written soon after, or just before, the close of that period and were the work of more than one pen. Whether this be so or not need not interfere with a proper appreciation of the stories, for their pictures of the life of the period may be accepted as reliable, perhaps more so than if some historian had tried to write them in connected history. Among the narratives are those relating Solomon's building of the temple, the visit of the Queen of Sheba, the Jezebel episode, the stories associated with Elijah and Elisha and the reforms under Josiah.

KINGSBURY, BENJAMIN FREEMAN (1872-), American zoologist, born in St. Charles, Mo., Nov. 18, 1872. He graduated from Buchtel College (1893), and took his Ph.D. from Cornell (1896) and his M.D. from the University of Freiburg (1903). His teaching career began as an instructor of Histology in Cornell in 1896, and he became an assistant professor in 1899. He was made an assistant professor in physiology in 1902, and he has been a professor in histology and embryology since 1908. He is the author of *Vertebrate Histology* (with S. H. Gage), 1900; *Laboratory Directions in Pharmacology,* 1905, *in Physiology,* 1906, *in Histology and Histological Technique,* 1910; and of *Histological Technique* (with O. A. Johanssen), 1927.

KING'S HENCHMAN, THE, a three-act opera by the American composer DEEMS TAYLOR (1885-), with libretto by EDNA ST. VINCENT MILLAY (1892-). It was first produced Feb. 27, 1927, at New York City. The quality of the music was highly praised by critics, notably for its appositeness to the Anglo-Saxon text, and was described by Lawrence Gilman as "the best American opera we have heard." The libretto dealt with the story of Æthelwold who is sent by King Ædgar, his foster-brother, to obtain Ælfrida for his queen. The king's henchman falls in love with Ælfrida and, keeping his royal mission secret, marries her. When the king visits Ælfrida, her husband kills himself to atone for his treachery to Ædgar.

KING'S HIGHWAY, a main road or thoroughfare in England which was under the protection of the King's Peace to make it safe for general public traffic. The term dates from the days when there were jurisdictions independent of the king's. Crimes committed on a public highway, however, were judged in the king's courts.

KINGSLEY, CHARLES (1819-75), English clergyman and writer, was born at Holne Vicarage, Devonshire, June 12, 1819. He was educated at King's College, London, and at Cambridge. In 1842 he was ordained and became curate, then vicar, at Eversley, in Hampshire, where he lived the rest of his life. He was chaplain to Queen Victoria, professor of history at Cambridge, and Canon of Westminster.

A most lovable personality and an admirable preacher, Kingsley became famous through writing. *Yeast* and *Alton Locke* express his sympathy with the Christian Socialist movement, but his brilliant powers of description are perhaps at their best in his famous novels, *Westward Ho!, Two Years Ago* and *Hypatia.* His books for children are *Water Babies* and *The Heroes.* Kingsley died at Eversley, Jan. 23, 1875.

KING'S LYNN, a town and seaport of Norfolk, England, lying about 97 mi. northeast of London. Historically dating from Saxon times, it has always ranked high among English seaports. Evidences of a town wall are found at the 15th century South Gate, and there are a fine late 17th century customs house, a rare Renaissance guildhall, and the octagonal Red Mount Chapel of the Perpendicular style. Fanny Burney, the novelist, was born at Lynn. To-day the fisheries, particularly productive of mussels, are extensive, and there are brass and iron foundries, shipbuilding yards, corn mills and rope, sail and agricultural implement manufactures. Pop. 1921, 19,975; 1931, 20,580.

KINGS MOUNTAIN, a city in Cleveland Co. in southwestern North Carolina, situated about 30 mi. west of Charlotte. Bus lines and the Southern Railroad serve the city. Cotton and corn are the chief crops of the region, and cotton products the leading manufactures. It was the scene of the BATTLE OF KINGS MOUNTAIN, a turning point of the American Revolution in 1780. The city was founded and incorporated in 1874. Pop. 1920, 2,800; 1930, 5,632.

KINGS MOUNTAIN, BATTLE OF, Oct. 7, 1780, an engagement of the REVOLUTIONARY WAR between a force of about 1,000 British regulars and Loyalists under Col. Ferguson and an approximately equal force of patriot frontiersmen under Isaac Shelby and John Sevier. The frontiersmen, a detachment from an army of 3,000 mustered on the southern frontier when Lord Cornwallis invaded North Carolina, encountered the British force entrenched upon a ridge about 30 miles westward of Charlotte, N.C. Kings Mountain is just within the limits of South Carolina. Scaling the ridge in the face of the British fire, the Americans dislodged the British force after an hour's engagement. The British casualties, over 250, included the death of Col. Ferguson; the remainder of the force surrendered. The American loss was 28 killed and 60 wounded. Having seriously checked Cornwallis's plans, the volunteer army dispersed and took no further part in the war east of the mountains.

KING-SNAKE, a name given popularly to members of a genus (*Ophibolus*) of harmless snakes, because of the general belief that they are mortal enemies of such poisonous serpents as the rattler and the copperhead. The king-snakes are powerful constrictors, and are indeed capable of doing battle with large venomous species, whose poison seems to have no effect on them. However, the idea that they go out of their way to kill poisonous snakes is mistaken, although they do sometimes include them, as well as non-poisonous forms, on their menus. Their usual diet consists largely of small rodents. There are seven species in the United States. The most common is the CHAIN-SNAKE. Other constrictors which kill venomous serpents are sometimes called king-snakes.

KINGSPORT, a city of northeastern Tennessee, in Sullivan Co. It is situated about 24 mi. west of Bristol on the Holston River. The Carolina, Clinchfield & Ohio Railroad and buses provide transportation. Kingsport lies in the midst of a rich coal-mining, lumbering and farming region. Dairy, poultry and grain farms are in the vicinity. Manufactures include wood alcohol, cotton goods, silk, hosiery, glass, wood pulp, paper, brick, tile, rayon and chemicals, the making of book cloth, book printing and binding. In 1929 the retail trade amounted approximately to $12,800,000. Pop. 1920, 5,692; 1930, 11,914.

KINGSTON, chief city of Frontenac Co., Ontario, Canada, well-situated at the mouth of the Cataraqui River, at the northeastern end of Lake Ontario, at the beginning of the St. Lawrence River, 165 mi. northeast of Toronto. Its environs being non-agricultural, Kingston's interests are largely industrial, centering upon important locomotive works, shipbuilding yards, woolen mills and numerous small manufactures. Steamer communication is maintained with Lake Ontario, the Rideau Canal, St. Lawrence and the Bay of Quints ports, and railroad facilities are supplied by the Canadian National and Canadian Pacific lines. Modern Kingston is largely a residential and educational city, well-planned and built, and favored as a summer resort. It is the seat of Anglican and Roman Catholic bishoprics, and of a Royal Military College, Queen's University and other large educational foundations. The first river and Great Lake steamboat was launched from its docks in 1812. Of antiquarian interest is Fort Henry, 1812-32, replacing an earlier structure. Established by Count de Frontenac in 1673, Kingston played an important part in Indian and Anglo-French wars. After destruction by the English in 1758, it was refounded in 1782 by the United Empire Loyalists, and incorporated in 1846. Kingston was the capital of Canada from 1841 to 1844. Pop. 1921, 21,753; 1931, 23,439.

KINGSTON, capital and principal seaport of JAMAICA, in the British West Indies. The town is situated on the southern coast and is noted for the beauty of its surroundings. It is the commercial center of Jamaica. Among important buildings are a theater, library, art-gallery and museum. Coconuts, logwood, coffee, sugar, oranges, copra, bananas, ginger and cigars are exported from Kingston. The town was established in 1693 when Port Royal was demolished by earthquake, but it was not the capital until 1872. Kingston is subject to earthquakes and the modern houses are designed with a view to withstanding the tremblors. In 1907 the town was practically demolished by earthquake. Since then it has been completely rebuilt. Est. pop. 1930, 70,252.

KINGSTON, a city and county seat of Ulster Co., N.Y., on the Hudson River and Rondout Creek, 90

mi. north of New York; it is served by the New York Central, Ontario and Western, Ulster and Delaware and West Shore railways, motor buses, river steamers and a private airport. It is the gateway to Catskill Mountain resorts and within view of the Shawangunk and Berkshire Ranges. Its industries include railroad shops and the production of brick, shirts, cigars, machines and boats. In 1929 the manufactures were valued approximately at $17,000,000; the retail trade in 1929 amounted to $21,159,646. Ashokan Reservoir, the huge storehouse of New York City's water supply, is about 3 mi. distant.

Kingston was settled by the Dutch about 1609. Indian attacks, fires and massacre caused its repeated abandonment. Governor Peter Stuyvesant named it Wiltwyck, or, *the Indian gift,* in 1661. Three years later, the English took possession and named it Kingston. It was New York's first capital. Pursuant to the Treaty of Ghent it was again under the control of the Dutch, 1673-1734, and was renamed Swanenburg. The first constitution of New York was adopted, the first legislature convened and George Clinton, the state's first governor under the constitution, was inaugurated in Kingston in 1777. In punishment for these patriotic actions the town was burned by the invading British on Oct. 16, 1777. Ten years later Kingston was being considered as a site for the national capital. Built in 1676, the building in which the first state legislature convened is now a state museum housing a unique collection of Colonial furniture and a large group of portraits by John Vanderlyn, early American artist. It was incorporated as a village in 1805 and became a city in 1872. Pop. 1920, 26,688; 1930, 28,088; about 15% were foreign-born.

KINGSTON, a borough in Luzerne Co., northeastern Pennsylvania, situated on the Susquehanna River opposite Wilkes-Barre; the borough is served by three railroads. Anthracite coal-mining is the leading interest. Kingston has railroad shops and factories turning out silk, stockings, clothing and adding machines. In 1929 the manufactured output was valued at approximately $5,000,000; the retail trade amounted to $11,236,250. The site was settled by forty pioneers from New England in 1769 and popularly called the "Forty Township." The borough was incorporated in 1857. A short distance from Forty Fort, established in 1772, was the scene of the Wyoming Massacre of 1778, when about 400 American men and youths met and were cut down by 1,100 British and Indians. A monument marks the spot. Dorranceton consolidated with Kingston in 1922. Pop. 1920, 8,952; combined population in 1920, 15,286; 1930, 21,600.

KINGSTON-UPON-HULL. *See* HULL.

KINGSVILLE, a town in Kleberg Co., southern Texas, located in the center of King Ranch, one of the largest in the world. It is situated 43 mi. southwest of Corpus Christi and is served by Missouri Pacific Railroad. Kingsville is a shipping point for an agricultural region producing truck, fruit, cotton, corn and live stock; it has various factories, cotton and cotton seed mills and railroad shops. Oil and natural gas are found in the vicinity. The town is the seat of a State College of Arts and Industries and the Texas-Mexican Institute for boys. Pop. 1920, 4,770; 1930, 6,815.

KINGTECHEN, a city of China in the province of Kiangsi. Situated on a small river which falls into Poyang Lake, about 95 mi. northeast of Nanchang. It is the principal place of manufacture of earthenware in China, and the seat of the imperial porcelain factory which was established 1004, during the reign of King Te of the Sung Dynasty. Pop. about 500,000.

KING WILLIAM'S WAR, 1689-97, an indecisive war between the French and English colonies in America, incidental to the War of the League of Augsburg in Europe. The war began with the sending of three expeditions of Indians and Canadians, under the general command of Gov. Frontenac of New France, against the border towns of New York and New England. One of these expeditions perpetrated the SCHENECTADY MASSACRE; another destroyed the village of Salmon Falls, N.H. The third ravaged several small villages in northern New England. A congress of delegates from the chief northern colonies met at New York in May 1690 and determined to attempt the conquest of Canada. An overland expedition against Montreal was a dismal failure; and the SIEGE OF QUEBEC by a fleet of 34 vessels under Sir William Phipps met a like fate. The Treaty of Ryswick, 1697, provided for a mutual restitution of all conquered territory in America.

KINKAJOU, a small mammal (*Potos flavus*) of the raccoon family, common in the forests of tropical America. It is about the size of a house-cat, and is clothed in soft, brown, lemur-like fur to the end of its long, prehensile tail. It is arboreal and nocturnal, feeding on fruit, honey, eggs, birds, and small mammals; is gentle, readily tamed, and makes a playful pet.

KINLEY, DAVID (1861-), American educator, was born in Dundee, Scotland, Aug. 2, 1861, and at 10 came to the United States. He studied at Yale, Johns Hopkins and the University of Wisconsin. From 1893-1930 he was associated with the University of Illinois, first as professor of literature and arts, then director of courses in commerce, dean of the graduate school, vice-president, and president from 1920-30. Kinley is the author of several important economic studies including *Monograph on Trusts,* 1899, and *Money,* 1904. He was the editor of *Preliminary Studies of the War,* 1913-22, for the Carnegie Endowment for International Peace.

KINNIKINNICK, the name given by North American Indians to various plants whose dried leaves were used for smoking, either with or without the admixture of tobacco. Among the plants so employed were the silky dogwood, the red-osier dogwood and the bearberry.

KINSHIP SYSTEMS. The kinship systems of primitive people differ from our own, but are derived logically from their habits of life. In a large family

group within which marriage is prohibited, the members of one generation often call each other brother and sister, even though they are third or fourth cousins. If such a group shares one dwelling the children may have but one name for their mother and her sisters, who seem like mothers to them. Frequently it is the custom for a woman, after her husband's death, to become the wife of his younger brother. Therefore, from the beginning, she calls this prospective husband by the same term she uses for her present husband. These usages differ for different communities and therefore each has its individual kinship system. *See also* DESCENT and LEVIRATE.

KINSTON, a city and county seat of Lenoir Co., eastern North Carolina; it is situated on the Neuse River about 70 mi. southeast of Raleigh. Bus lines and two railroads serve the city. Tobacco and cotton are the chief crops of the region. Kinston is an important industrial center manufacturing principally tobacco, yarn, cottonseed oil, and fertilizers. In 1929 the value of the industrial output was about $2,000,000; the retail trade amounted to $7,304,494. The Battle of Wise Forks of the Civil War was fought here. The city was founded in 1762 and incorporated in 1826. Pop. 1920, 9,771; 1930, 11,362.

KIOWA, a North American Indian tribe and linguistic stock. The aboriginal habitat was in the region of the upper Arkansas and Canadian rivers in Colorado and Oklahoma, though their traditions place them at the head of the Missouri River, near the present Virginia City, Mont. The Kiowa were in amicable alliance with the Crow, but driven by the Cheyenne and Arapaho, with whom they did not make peace until about 1840, as well as by the Sioux, they moved gradually southward to the Arkansas River where they encountered the Comanche with whom they fought. Later, after the conclusion of peace, the Comanche became their close confederates, an alliance which has since persisted. With the warlike Comanche they raided the settlements of Texas and Mexico, killing and plundering the whites. Never very numerous, they have been decimated by war and disease. The remnants of the tribe live on allotted lands in Oklahoma. The tribal divisions were the Kata, Kogui, Kaigwu, Kingep, Semat or Kiowa Apache, Kongtalyui, and the now extinct Kuato. They were culturally typical hunters of the Plains, with endogamous marriage between the seven divisions of the stock, and maintained a camp circle.

KIPLING, RUDYARD (1865-), British author, was born in Bombay, India, Dec. 30, 1865. After education in the United Services College, Westward Ho, North Devon, he returned to India at 17 and entered newspaper work in Lahore. There he wrote and published locally many of the stories that later attracted wide attention. When he returned to England in 1889 he found himself already famous. He has been one of the greatest living masters of the short story, and much of his fame is due to these tales, especially those dealing with life in India. Kipling's novels have been less highly considered, although widely read. His verse, both lyric and ballad, almost equals his short stories in popularity. The two *Jungle* books are considered among his most distinctive, imaginative and finely finished work. In 1907 Kipling received the Nobel Prize for Literature. For 40 years he has been one of the most arresting and interesting figures in modern British literary life because of the zest of his work, the romantic quality of his Indian tales, the swinging rhythms of his lyrics and ballads, the fresh, vigorous, unhackneyed quality of his imagination. A few of his many books are *Plain Tales from the Hills, Soldiers Three, Barrack Room Ballads, The Seven Seas, Kim* and *Puck of Pook's Hill.*

KIPPER, a name applied to a male SALMON or sea TROUT after spawning and also to a landlocked salmon, but especially to a salmon or a herring cured by kippering, that is, by cleaning, salting and spicing and then drying or smoking.

KIRCHHOFF, GUSTAV ROBERT (1824-87), German physicist, was born at Königsberg, Mar. 12, 1824. In 1850 he became professor of physics at Breslau, in 1854 at Heidelberg, and in 1874 member of the Prussian Academy of Science and professor at the University of Berlin. He made researches in electrical phenomena and derived a number of the laws of resistance and induction. His work on thermodynamics, in his investigation of the physical and chemical nature of heat and light, was of great value. His great work, performed jointly with R. W. von Bunsen, was in the field of spectrum analysis. He died at Berlin, Oct. 17, 1887.

KIRKCUDBRIGHT, a royal burgh and county town of Kirkcudbrightshire, Scotland, situated about 73 mi. south of Glasgow, at the mouth of the Dee. The place name commemorates the temporary burial of St. Cuthbert in the town. Conspicuous in Scottish history, Kirkcudbright suffered much from the border wars. Among existing antiquities are an ancient market cross, Bomby Castle, built about 1582, now in ruins, and several old town buildings. Paul Jones in 1778 raided St. Mary's Isle, a part of Kirkcudbright. The harbor is rendered commercially impracticable by the tide. Pop. 1921, 2,101; 1931, 2,311.

KIRKLAND, JAMES HAMPTON (1859-), American educator, was born in Spartanburg, S.C., Sept. 9, 1859. He graduated in 1877 at Wofford College, where he was professor of Greek and German from 1881-83. After further study at Leipzig he served from 1886-93 as professor of Latin at Vanderbilt University, where in 1893 he became chancellor and professor of Latin language and literature. Kirkland edited *Satires and Epistles of Horace,* 1893, and has contributed frequently to educational journals.

KIRKLARELI, also **KIRK-KILISSA,** a town of European Turkey, in the vilayet of Edirne (Adrianople), about 35 mi. northeast of this city. The town has several fine mosques and numerous churches, from which it derives its name. Tobacco, butter, cheese, wine, brandy and cereals are the chief products. During the Balkan War of 1912 the town was

the scene of severe fighting between the Turks and the Bulgarians. The latter won here their first important victory. By the Treaty of London, 1913, the town was ceded back to Turkey. Occupied by the Greeks in 1920, it was held until it was restored to Turkey together with Adrianople and Eastern Thrace in 1922. Pop. 1927, about 16,000.

KIRKSTALL ABBEY, the ruins of a Cistercian abbey founded in 1152, now included in the borough of Leeds, in the West Riding of Yorkshire, England. The remains, comprising the finest ruin in Yorkshire after FOUNTAINS ABBEY, include the roofless Transitional church, the chapter house, cloisters, kitchen, refectory and abbots' lodging. The picturesque ruin was presented to the city of Leeds in 1889 by Colonel North.

KIRKSVILLE, a city in northeastern Missouri, the county seat of Adair Co., situated 129 mi. northwest of Jefferson City. Two railroads afford transportation. There is a government landing field near by. Kirksville is a shipping market for farm crops and coal of the vicinity. The chief industry is shoe manufacturing. Located here are the Northeast Missouri State Teachers College and the Kirksville College of Osteopathy and Surgery. In 1899 the city was devastated by a tornado. Pop. 1920, 7,213; 1930, 8,293.

KIRKWOOD, a city in St. Louis Co., eastern Missouri, situated near the Meramec River. It is a residential suburb of St. Louis, served by bus lines and two railroads. Kirkwood was founded in 1851; incorporated in 1900. Pop. 1920, 4,422; 1930, 9,169.

KISFALUDY, KÁROLY (1788-1830), Hungarian poet, dramatist and novelist, was born at Tet, near Raab, Feb. 5, 1788. He studied philosophy and law at the University of Pressburg, and entered the army after a short period in the profession of law. Retiring from military life in 1799, he was thereafter free to devote himself entirely to literature. Kisfaludy is known as the "father of modern Hungarian drama" and his tragedy *Irene,* 1820, is considered one of the greatest in Hungarian literature. Equally celebrated for their bright pictures of Hungarian life in the 19th century are his comedies *Rebels, Murderer* and *Illusions.* In addition his novels and humorous sketches have earned the author an enduring place in Hungarian literature. Kisfaludy died at Somla, Hungary, Nov. 11, 1830.

KISHINEV. *See* CHISINAU.

KISMET, an Arabic word meaning distribution. It came to mean what is distributed, or man's lot, or destiny. The Turks especially have made the term familiar to the West. With them it meant strictly fate. The Turkish kismet also referred to the official charged with the oversight of certain funds in pious foundations. Kismet should not be confused because of its implication of fatalism with the term *qader,* which is the strictly theological word among Moslems denoting the power of Allah. Says the Moslem, "There is no power save in Allah," from which is easily deduced the belief that man's life is wholly determined by God.

KISPETH* or *LITTLE PEST, *a township south of Budapest, Hungary, situated on the Puszta St. Lörincz, with villas and a factory section.* Kispeth has its own municipal council and mayor. Pop. 1930, 64,547.

KISSING BUG. *See* ENTOMOLOGY, MEDICAL; TROPICAL MEDICINE.

KITAMAT, a North American Indian tribe speaking the Heiltsuk dialect of the Kwakiutl division of the Wakashan linguistic stock. They live on Douglas Channel in British Columbia and are divided into six exogamous clans. Their population is under 300.

KITCHEN CABINET, the group of personal friends whom President Jackson consulted on matters of state and party policy. The members of the actual cabinet were, with the exception of Martin Van Buren, undistinguished men. Shortly after his inauguration the President ceased to call cabinet meetings, conferring instead with the group jocosely called the kitchen cabinet, in allusion to their informal nature. Its principal members were Duff Green, Amos Kendall, William B. Lewis and Isaac Hill.

KITCHEN EQUIPMENT. The city and suburban kitchen of to-day can be as carefully planned for operative efficiency as the workshop or office. Not only is the equipment—range, refrigerator, sink, dishwasher, kitchen cabinet and other details—developed for efficient operation, but the relation of these several elements has been carefully considered to reduce waste motion and eliminate unnecessary space. In planning a completely modern kitchen, the height of the woman who will use it determines the height not only of the shelves in the closets and on the wall, but of the sink, the kitchen table, the range, the dishwasher and other working surfaces. Practically all kitchen equipment is now built in, except the work table, which is provided with large rubber castors, so that it can be readily moved to wherever it is needed.

Much of the actual detail of cooking can be made automatic, cooking methods having been developed for use with the electric range and the electric or gas refrigerator which free the housewife from constant attendance, once she has prepared the food and placed it in the oven, or in the refrigerator. A highly useful kitchen device is the electric motor mixer, which is provided with many useful attachments, which will beat, mix or grind foods, turn an ice cream freezer, and perform in general all those kitchen tasks which once required the expenditure of human energy. DISHWASHERS in the most modern homes form a part of the sink.

Lighting in the kitchen is important. In rather large kitchens there should be a light of approximately 150 watts over the stove and a similar light not only in the center of the kitchen but over the sink. In smaller kitchens the light should be placed to give good illumination both at the sink and at the stove. A simple form of diffusing glass globe has been developed as the best type of lighting fixture. Two other items of equipment without which the kitchen of to-day is not completely equipped are the ventilator

and the electric wall clock. Especially in those kitchens where gas is used as the cooking fuel, the ventilator, either built in or installed in a removable panel which fits in the window like a fly screen, dispenses with cooking odors. L. E. M.

KITCHENER, HORATIO HERBERT, EARL (1850-1916), British soldier, was born at Bally Longford, Ireland, June 24, 1850. He was educated in France, and at the Royal Military Academy, Woolwich. In 1870, he served against the Germans in France, received a commission in the Royal Engineers the following year, engaged in the Palestine Survey 1874-77, the Cyprus Survey, 1878-82, and was made Commander of Cavalry in Egypt in 1882. He assisted in the expedition for the relief of Gordon, 1885, and was appointed commander-in-chief of the Egyptian Army, 1892, distinguishing himself in many ways till 1900. In the South African War he played a prominent part, and afterwards received the title of viscount, becoming earl in 1914. As secretary of war at the beginning of the World War, he raised a powerful army in a short time. While on his way to Russia, he was drowned on board the cruiser *Hampshire,* off the Orkney Islands, June 5, 1916.

KITCHENER, a city and the capital of Waterloo Co., and port of entry of Ontario, Canada, situated 62 mi. southwest of Toronto, on the Grand River. Lying 86 mi. northwest of Niagara Falls, Kitchener was the starting point of the Niagara power development which now supplies the prosperous farming and industrial area of which it is the distributing center. Rubber and leather goods, furniture, metal, and creamery products and beet sugar are among the diversified local manufactures. A substantially planned city, Kitchener formerly was known as Berlin, the name being changed during the World War by the inhabitants who are largely of German descent. The site was settled as early as 1816-30, the town incorporated in 1854, the city in 1912. Pop. 1921, 21,763; 1931, 30,793.

KITCHEN MIDDENS, prehistoric refuse heaps of Mesolithic and Neolithic people who lived chiefly on shellfish, perhaps more than 6,000 years ago, first discovered along the eastern shores of Denmark about 1850. They were of immense size and overgrown with grass and trees, but their contents proved to be a treasure house of interesting antiquities, including stone and bone implements, bones of animals and potsherds, along with the discarded shells. The number of artifacts in the great mound at Meilgaard has been estimated at 103,400. There are indications that the dog was domesticated and that boats were built; but there are no signs of agriculture. Similar refuse heaps have now been found all over the world. For American middens, *see* SHELL HEAPS.

KITE, a name applied to various birds of prey characterized by exceedingly light and graceful flight. Of the true kites (*Milvus*), which are found only in the Old World, there are but six species, all birds of medium size with long, sharp-pointed wings and long, forked tails. They subsist largely upon refuse *and carrion but also feed upon reptiles, birds and small mammals. The common kite or glead (M. ictinus),* about 2 ft. long with reddish-brown plumage, was formerly very abundant in central and southern Europe and also in the British Isles, where it served as a scavenger in city streets. Its peculiar habit of placing bones, rags and other rubbish in its nest, usually built in a tree, is mentioned by Shakespeare. In the United States several similar and more or less closely allied birds of prey are known as kite (*Elanoides forficatus*), found from the northern states to South America, the white-tailed kite (*Elanus leucurus*), ranging from the



MISSISSIPPI KITE

southern states to South America, and the Mississippi kite (*Ictinia misisippiensis*) of the Mississippi Valley and southward.

KITES, contrivances made of light wooden frames, covered with paper or fabric. Though their origin is unknown, apparently their earliest use was in China and Japan, where kites, made to resemble bats, dragons and other grotesque creatures were used at religious festivals. Early Asiatic peoples believed that a kite flying over their dwellings frightened away evil spirits.

The modern kite has three chief uses, as a toy, as a carriage for meteorological instruments, and as a military signaling device. The toy kite, used by children of all nations, may be designed in various ways. A common example is the kite shaped in an isosceles triangle, made by crossing two sticks connecting the extremities with string and covering the frame with paper. Small pieces of paper or cloth are tied together or on a short string to make a tail, which is attached to the pointed end of the kite. A long string is attached near the top of the frame, near the point of intersection of the sticks, and the end held while the kite is in flight. In a moderate wind, a kite of this simple design will fly aloft after a run of a few yards. By playing the kite, namely, pulling it in and out, it may be raised to more than 1,000 feet.

More elaborate kites are employed for scientific purposes. A celebrated instance of kite-flying was the experiment conducted in 1752 by Benjamin Franklin, whose kite determined the electrical character of lightning. In 1895 Capt. B. F. S. Baden-Powell of England raised himself 100 feet by a tandem of box-kites. After this proof that the contrivances could raise a moderate weight, other kite enthusiasts, W. A. Eddy, Lawrence Hargrave and others, raised tandem kites

to altitudes in excess of 5,000 feet. At Blue Hill Observatory, near Boston, Hargrave kites reached a height of 9,375 feet above sea-level. It was thus apparent that kites could carry meteorological instruments capable of returning valuable data pertaining to the upper stratums of atmospheres. In 1898, 17 weather bureau stations were equipped with kites, at the instigation of Prof. W. L. Moore, chief of the United States Weather Bureau. The modern meteorological kites, now used throughout Europe and America, are of box design, with a sail area of from 30 to 80 square feet, and are flown on a steel wire. Kites have been used by the army in the United States and England as signaling devices, carrying flags and semaphores, or for purposes of aerial photography.

KITKAHAXKI, a North American Indian tribe belonging to the PAWNEE confederacy and speaking a dialect of the Caddoan linguistic stock. They lived to the west of the Chaui, another member of the federation, and prior to the establishment in 1875 of their reservation in Oklahoma where they now live, they lived on the Loup River in Nebraska. Culturally they and the cognate tribes were entirely similar. The Kitkahaxki were themselves composed of three divisions: the Great Kitkahaxki, the Little Kitkahaxki, and the Blackhead Kitkahaxki.

KITTANNING, a borough of western Pennsylvania, the county seat of Armstrong Co., situated on the Allegheny River, 44 mi. northeast of Pittsburgh. It is served by two railroads. The surrounding district is agricultural. Coal mines, clay, iron, limestone deposits and oil fields are found in the vicinity. The local manufactures include plate glass, gas, well supplies and machinery. Kittanning was founded as a trading post, permanent settlers coming in 1795. Pop. 1920, 7,153; 1930, 7,808.

KITTIWAKE, a genus (*Rissa*) of oceanic gulls frequenting northern coasts. The common kittiwake (*R. tridactyla*) of both shores of the North Atlantic, and represented in the North Pacific by an allied variety (*R. t. pollicaris*), is about 16 in. long, with black or dusky feet, and snowy white plumage relieved by a pearl gray mantle and black wing tips. It feeds chiefly upon fish and breeds in colonies on inaccessible rocky cliffs, laying two to five brown-spotted, buffy or grayish eggs. Its cry is a singular "kittiaa, kitti-aa." The red-legged kittiwake (*R. brevirostris*), a handsome bird of the coasts and islands of Bering Sea, is distinguished by its brilliant red legs and feet.

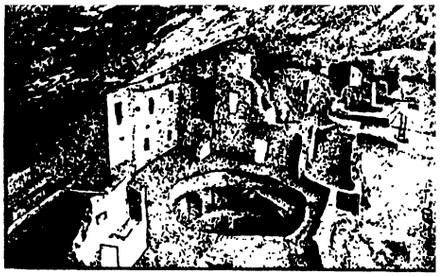
KITTREDGE, GEORGE LYMAN (1860-), American educator, was born in Boston, Mass., Feb. 28, 1860. He graduated from Harvard in 1882, and joined the English department there in 1888, becoming professor in 1894. Kittredge edited the *Athenaeum Press Series of English Classics,* 1890-1905, with C. T. Winchester, and the *Albion Series of Anglo-Saxon and Middle English Poetry,* 1900-07, with H. B. Bright. His many books on English literature include: *The Language of Chaucer's Troilus,* 1894; *Old Farmer and His Almanac,* 1905; *English Witchcraft and James I,* 1912, and *Witchcraft in Old and New England,* 1929.

KITTY HAWK NATIONAL MONUMENT. at Kill Devil Hill, Kitty Hawk, N. C., marks the spot of the first sustained flight of a heavier-than-air machine. On Dec. 17, 1903, a plane designed by ORVILLE and WILBUR WRIGHT rose from the ground under its own power, remained aloft 59 seconds and flew 852 ft. The monument, a 60-foot-high granite pylon, was dedicated Nov. 19, 1932, and is under the administration of the War Department. A granite boulder erected by the National Aeronautic Association also commemorates the achievement. Kitty Hawk is reached from Elizabeth City.

KIUKIANG, "Nine Rivers," a treaty port of Kiangsi province, China. It lies on the banks of the Yangtze River, 12 mi. above the outlet of Po-Yang Lake and about 460 mi. from Shanghai. The high peaks of the Lu Mountains, including the popular summer resort of Kuling, are south of the city. Important exports include tea pressed into bricks, porcelain, grass-cloth, tobacco, beans and paper. Kiukiang was opened to foreign trade in 1861 and was found particularly useful because of its 1,500-ft. river frontage. Pop. 1929, 43,987.

KIUNGCHOW, the chief city and center of government for the tropical Chinese island of Hainan, lying off Luichow Peninsula in southern Kwantung. The high, wild island, undeveloped and still thickly forested, has its opening through Kiungchow whose actual port is Hoihow, 3 mi. away. Exports are sugar, pigs, sesamun seeds and dried fruits. Foreign trade was opened in 1858 by an agreement of the Treaty of Tientsin. Pop. 1929, 45,751.

KIVA, the Hopi Indian name for the subterranean or semi-subterranean ceremonial room which is invariably found in the modern Pueblo Indian villages of New Mexico and Arizona, and is characteristic as well of prehistoric pueblo sites everywhere in the southwestern part of the United States. The kivas were either round, as in the Rio Grande area, or rectangular, as among the Hopi and Zuñi, while at some prehistoric villages, as at the famous Aztec Ruin and at Pueblo Bonito in New Mexico, large circular



KIVA AT SPRUCE TREE HOUSE, COLORADO

kivas with a concentric outer circle of rooms have been excavated and described. The older form appears to have been circular. The number of kivas in each Pueblo village varied somewhat with its size. The usual mode of entrance to a kiva is by a ladder

through an opening in the roof. The roof is usually supported by cross beams, the floors are of sandstone slabs, and the walls are surrounded by a bench, with a low platform at one end. The center of the floor usually contains a fire pit. The kiva is essentially a "men's house," consecrated to ceremonials and to mundane affairs from which women are excluded.

KIWANIS INTERNATIONAL, a business and community service organization established after the founding of the first Kiwanis club at Detroit, Mich., in Jan. 1915. Its purpose is "to encourage the daily living of the Golden Rule in all human relationships; to promote the adoption and application of higher social, business and professional standards; to develop, by precept and example, a more intelligent, aggressive and serviceable citizenship; to provide, through Kiwanis clubs, a practical means to form enduring friendships, to render altruistic service, and to build better communities." Active members must be men of good character and community standing, occupying well-established positions in recognized lines of business, agricultural, institutional and professional life. In 1932 membership totaled 103,200, with clubs established throughout the United States and Canada.

KIWI, the common name for species of *Apteryx,* very curious flightless birds, native to New Zealand. They are about the size of a domestic fowl, with very rudimentary wings, exceedingly long bills, powerful legs and hairlike plumage. *See* APTERYX.

KLACKAMAS or **CLACKAMAS,** a North American Indian tribe speaking the Upper Chinook dialect of the Chinookan linguistic stock. They formerly lived in several villages along the Clackamas River in Oregon. From a population of some 1,800 in 1806, they dwindled to 88 in 1851, when they claimed the land on the eastern banks of the Willamette River from near its mouth to Oregon City and eastward to the Cascade Mountains. These lands they ceded to the United States in 1855. Later the Klackamas were removed to the Grande Ronde Reservation in Oregon.

KLAGENFURT, capital of the Austrian province of Carinthia, situated in a fertile valley on the River Glan and surrounded by wooded hills. It is a spacious and busy industrial town with considerable transit trade and many educational institutions. The cathedral was built in 1582-93 by Protestants, but was turned over to the Jesuits in 1603 and to the Prince Archbishop of Gurk, resident in Klagenfurt, in 1787. Carinthia was ceded in 880 to Arnulf, who later became emperor, and has been part of Austria since 1335. Pop. 1923, 27,423.

KLAIPEDA (MEMEL), the largest seaport of Lithuania, situated on a lagoon of the Baltic Sea about 90 mi. northeast of Königsberg. The city has a spacious harbor protected by a modern lighthouse, and is an industrial center of considerable importance. Besides extensive shipbuilding yards, there are breweries and iron and steel foundries. Soap and chemicals are manufactured. Founded in 1252 Klaipeda was a member of the Hanseatic League. Before the World War it was part of Germany. In 1924 the Conference of Ambassadors ceded it to the Lithuanians, who had occupied it in a surprise attack on Jan. 15, 1923, and forced the Allied troops, who had held the city since it was evacuated by the Germans, to leave. Pop. 1931, 36,988.

KLAMATH, a North American Indian tribe of the Lutuamian or Klamath linguistic stock living in southwestern Oregon, particularly around Upper Klamath Lake and on Williamson and Sprague rivers. They are closely related linguistically and culturally to the Modoc, and with the Modoc they ceded the greater part of their lands and were settled on the Klamath Reservation in 1864. Like the tribes on the coast to their north they held slaves, which were sometimes exchanged to the CHINOOK.

KLAMATH FALLS, a city in southwestern Oregon, the county seat of Klamath Co., situated on Upper Klamath Lake, Lake Ewauna and the Link River, 20 mi. from the state border. Three railroads serve the city. There is an airport. Live stock is raised in the district, and dairying is a major interest. In 1929 the value of the manufactures was about $5,000,000; the retail trade amounted approximately to $14,620,000. Mt. Shasta can be seen in the distance, and the Modoc Lava Beds and Crater Lake are in the vicinity. Klamath Falls was incorporated in 1905. Pop. 1920, 4,801; 1930, 16,093.

KLAUSENBURG. *See* CLUJ.

KLÉBER, JEAN BAPTISTE (1753-1800), French general of the Revolutionary period, born at Strasbourg, Mar. 9, 1753. He was trained to be an architect and came to Paris to follow this profession, but his instinct for leadership procured him an appointment to the military school of Munich, where his talents obtained for him a commission in the Austrian army. In 1783 Kléber returned to France, and became inspector of buildings at Befort, where he studied military science. The French revolution gave him the opportunity he desired. He enlisted in 1792, and distinguished himself at the defense of Mainz. He was promoted brigadier-general in 1793, and sent to the Vendée to quell the Catholic and royalist insurrection. He was made general of a division, but was recalled in 1794. Kléber further distinguished himself at Fleurus and at the siege of Mainz, 1795. He was Jourdan's most active lieutenant, but retired early in 1798, to be entrusted with a division in NAPOLEON'S Egyptian expedition. He then served as governor of Alexandria. In 1799 Kléber won the brilliant victory of Mont Tabor. When Napoleon returned to France, he appointed Kléber commander-in-chief. Kléber almost achieved the pacification of Egypt, and when Lord Keith, the British Admiral, tried to exact an unconditional surrender from him, he decided to fight, winning the battle of Heliopolis, Mar. 20, 1800. He retook Cairo and successfully carried out a second Egyptian campaign. As an administrator he was no less able than as a general. He was assassinated by a Mohammedan fanatic, at Cairo, June 14, 1800.

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KLEBS, EDWIN (1834-1913), German pathologist, was born at Königsberg, Feb. 6, 1834. He studied medicine at Würzburg, Jena, and Berlin, and in 1861-66 was assistant to Virchow at Berlin. He became professor of pathological anatomy at Berne (1866), at Würzburg (1872), Prague (1873) and Zurich (1882-92). With Loeffler, Klebs discovered the bacillus of diphtheria, and also investigated malaria and the infection of wounds. He spent some time in the United States about 1895-96. Klebs died at Berne, Oct. 23, 1913.

KLEINSMID, RUFUS BERNHARD VON (1875-), American educator and psychologist, was born in Sandwich, Ill., June 27, 1875. He was a traveling student in Europe in 1901, and graduated at Northwestern University in 1905. From 1905-09 Kleinsmid was professor of education at De Pauw University and from 1909-14, professor of psychology. He was president of the University of Arizona from 1914-22, when he became president of the University of Southern California. He is the author of many monographs on psychology and criminology.

KLEIST, BERND HEINRICH WILHELM VON (1777-1811), German poet, dramatist and journalist, was born at Frankfurt-on-Oder Oct. 18, 1777. He enlisted in the Prussian army at 15, and served for 7 years before he decided to return to his studies. He traveled to France and Switzerland, and turned to the drama, a field well suited to his unusual talents. Under the influence of GOETHE, SCHILLER and Wieland, whom he visited at Weimar, Kleist wrote a series of tragedies filled with wild passion, romantic energy and dramatic intensity that thrilled the German readers of his generation. His journalistic work as well as the comedies, novels and lyrics that he wrote are moderately important. Kleist died at Potsdam, Nov. 21, 1811. *See also* GERMAN LITERATURE; STRUM UND DRANG.

KLEIST, EWALD CHRISTIAN VON (1715-59), German poet, was born in Zeblin, Pomerania, Mar. 7, 1715. His monotonous life as a Prussian soldier predisposed him to those pensive reflections illustrated in his famous poem *Spring,* 1749. As landscape poet, he continued the tradition of Haller and Thomson. He wrote idyls, odes, elegies and songs, all filled with the lyric joy in freedom from contact with the crowd and worldly preoccupations. LESSING admired his poetry and became his intimate friend, afterward portraying him as the soldier-hero, Tellheim, in his drama, *Minna von Barnhelm,* 1757. Kleist was mortally wounded in the Battle of Kunersdorf, and died in Frankfort-on-Oder, Aug. 24, 1759.

KLICKITAT, a North American Indian tribe speaking a language of the Shahaptian linguistic stock. Their territory, situated in Washington at the headwaters of the Cowlitz, Lewis, White Salmon and Klickitat rivers, was bounded on the east by the Yakima, a tribe closely related in language, and on the west by peoples belonging to the Salishan and Chinookan groups. The Klickitat are known chiefly as traders and served as middlemen between the coast tribes and those living to the east of the Cascade Range. In 1855 they ceded their lands to the United States and are now on the Yakima Reservation, so interbred with other tribes of the area that few full bloods are recognized. The Topinish and Taitinapam are branches of the Klickitat.

KLINCK, LEONARD SYLVANUS (1877-), Canadian educator and agriculturist, was born in Victoria Square, Ontario, Jan. 20, 1877. He was educated at Ontario Agricultural College and Iowa State College. From 1905-14 Klinck was associated with the cereal husbandry department of MacDonald College. In 1914 he became professor of agronomy and dean of the faculty of agriculture at the University of British Columbia, where five years later he was made president. He developed several new varieties of corn and beans.

KLINGER, FRIEDRICH MAXIMILIAN VON (1752-1831), German dramatist, novelist and critic, was born at Frankfort-on-Main, Feb. 17, 1752. He studied law at the University of Giessen, but turned to dramatic production. Klinger's most famous play of this early period, when he was under the influence of Goethe, was *Sturm und Drang,* 1776, a name that has since been applied in literary history to an entire movement in the history of German literature. Klinger spent a great part of his life in Russia, attaining to high official rank under the Russian government. It was in Russia that he wrote many of his popular romances and much of his critical philosophy. He died at St. Petersburg, Russia, Feb. 25, 1831.

KLIPSPRINGER, a small antelope (*Oreotragus oreotragus*), about 3 ft. long, almost tailless, height nearly 2 ft. with horns about 4 in. The name comes from the quick jump of the animal, as if released by a spring. Most of the mountainous or rocky parts of Africa are frequented by pairs of this little, goatlike antelope, which is usually seen perched on pinnacles of rock.

KLOPSTOCK, FRIEDRICH GOTTLIEB (1724-1803), German poet and dramatist, was born at Quedlinburg, Saxony, July 2, 1724. While yet a boy, he read Milton's *Paradise Lost* in translation, and this proved the initial inspiration for his epic *Messias,* three cantos of which appeared in 1748. Thereafter Klopstock was a name of magic to intellectual Germany. In 1751 the poet was pensioned by the Danish Government in order to give him leisure to complete his great epic. The last of the 20 cantos appeared in 1773, completing the total work of 20,000 lines. Embittered by the neglect of Frederick the Great, he withdrew more and more from the actual world. He continued to write, however, and subsequently produced three Biblical dramas of little dramatic worth, and his renowned *Odes,* in which he tried to re-invoke ancient Germany. Schiller remarked of Klopstock that "he makes everything lead up to the infinite," and his influence on Goethe was also apparent. Kuno Francke observed, "It is from Klopstock that we may justly date the revival of German letters and the growth of national

consciousness in German-speaking lands." The poet's death at Hamburg, Mar. 14, 1803, was accompanied by an unparalleled tribute of mourning by the German nation.

KNAIAKHOTANA, a North American Indian tribe of the northern division of the Athapascan linguistic stock, occupying Kenai Peninsula, Alaska, the drainage of Knik and Sushetna rivers, and the shores of Iliamna and Cook lakes. They were early in contact with Russian traders and missionaries, with consequent hostilities, attempts at conversion to Christianity, the establishment of settlements and the teaching of agriculture, none of which was successful. In 1838 a smallpox epidemic decreased the native population by half. The Knaiakhotana are hunters and fishers; though they use dogs for hunting, they have never learned from their Eskimo neighbors to harness them to sleds, using them simply as pack animals. Interior travel is by their own birchbark canoes; on the coast, skin boats purchased from the Eskimo are used. The older form of house was communal, but the tribe now lives in well-built log houses in villages. Like that of the other northern tribes, their clothing is of skins. Socially the Knaiakhotana are organized into 11 clans, forming two phratries. The population is now much depleted and the ancient culture completely dominated by European traits.

KNARESBOROUGH, an urban district in the West Riding of Yorkshire, England, picturesquely situated in the valley of the Nidd, 16 mi. northwest of York and 203 mi. northwest of London. The Norman castle, of which a 14th century keep survives, afforded Thomas à Becket's slayers a year's refuge. An old-world town, it contains many quaint antiquities, among which are a 14th century wayside shrine, Mother Shipton's Inn and St. Robert's Chapel, a limestone cave crudely carved. Modern Knaresborough is largely agricultural, but there are leather and linen manufactures, and limestone quarrying. Pop. 1921, 5,518; 1931, 5,942.

KNEE, the joint formed by the thigh-bone or femur above and the shin-bone or tibia below. The articulation between the knee-cap or patella is also included as part of the knee-joint, since it takes part in its movements.

The round medial and lateral condyles of the femur (*see* SKELETON) rest upon the flat surface of the upper end of the tibia, and are held in place by ligaments between the bones, which surround the joint. The patella, in front, also aids in maintaining the strength of the knee, as it is fixed in place by being attached above to the strong muscles of the front of the thigh and below to the front of the tibia. Strong fibrous bands on either side of the joint prevent sidewise dislocation, and two ligaments apparently within the joint prevent extension from proceeding beyond a straight line. A thick rim is formed on the tibial surface during life by semilunar cartilages on either side. (*See* the illustration in JOINTS AND LIGAMENTS.)

It would seem that a rounded surface, supporting the weight of the body on a flat surface, would be a very unstable arrangement. However, the knee is one of the strongest and least dislocated of the joints, due largely to the strength of the ligaments which surround it, and to the firm check and locking which they produce on attempts at over-extension.

W. J. S. K.

KNIFE, any tool having a more or less sharp edge on a thin blade, and used for cutting wood, paper or other soft substances. Pocket knives and kitchen knives are the most common types. Some knives depart radically from this definition, as, e.g., knives for paper-cutting machinery and for some wood-working machines which have a thick blade with the edge beveled at 30 to 45 degrees. There are many special varieties of knives such as the draw-knife for wood workers and the knives that macerate wood into pulp in paper making.

KNIGHTHOOD. The source of knighthood has been seen in the custom of Germanic tribes in occasionally giving the son of a chief investiture with a sword. So many centuries of change and confusion, however, separate the rise of the institution in Europe from the days of the roving Germanic tribes, that it is probably safer to regard knighthood as an institution which grew naturally and of itself with the development of European society.

Knights appear at first to have been all the men holding land by military tenure from a lord; but later knighthood became separated from the concept of tenure and became the badge of a class. Knighthood thus remained something conferred by the sovereign, as the fief had originally been, and not, as the fief became, something inherited. Hence the most a man could inherit was the right to have knighthood conferred upon him, and many new men could be created knights, usually for distinguished actions upon the battlefield. Knightly society soon developed definite divisions, the knights banneret and knights bachelor, differing chiefly in their power as feudal lords, and the stages of initiation towards knighthood, the squire and page. In later times the squire largely ceased to be a step towards knighthood and became a definite social status of its own.

KNIGHTS OF COLUMBUS, a fraternal Order for Catholic men, established at New Haven, Conn., in 1882, to promote active Catholicity and patriotism among the members, to foster social intercourse, recreation, and intellectual interests, and as a benefit society through the operation of its insurance system. The Order is governed by a Supreme Council composed of Supreme Officers, Supreme Directors, Past Supreme Knights, and officers and representatives of state councils, of which there are 63. The executive body is the Supreme Board of Directors, comprising seven Supreme Officers and 15 Supreme Directors, all of whom are elected by the Supreme Council. The Order has 2,552 subordinate councils, located in the United States, Canada, Newfoundland, Mexico, Alaska, Panama, Cuba, Puerto Rico, and the Philippines. It has a membership of 571,209 of whom 259,427 were in the insured class, the insurance in force amounting

to $296,333,926. During the World War the Order was one of seven organizations authorized by the government to carry on welfare work for the men in the service. The Order expended approximately $44,000,000 in its war work, one-third of which amount was raised by the Order itself and two-thirds representing amount received from United War Work Campaign Fund. It sent more than 1,000 secretaries overseas, and won universal praise for its broad and generous policy. Since the war the Knights of Columbus have engaged in many enterprises involving public welfare and relief work, which included hospital activities for the former service men in more than 400 hospitals throughout the United States. Another feature of the post-war work was that of finding jobs for the men after they were demobilized, and providing educational facilities for them through college scholarships, free evening schools, and correspondence courses. Since 1923, the Order has carried on a program of Boy Guidance Work. A junior order known as the Columbian Squires was instituted to promote spiritual, social, cultural, physical and civic activities of boys. The program has expanded into 42 jurisdictions of the Order. The first professional training course for boy workers on a post-graduate basis was inaugurated in September, 1924 at the University of Notre Dame with the endowment of a Chair in Boy Guidance and enrollment of a class of 24 college graduates for the course. The Knights of Columbus endowed a Chair in American History at the Catholic University of America, Washington, D.C., and also provided an endowment fund of $500,000 for 50 scholarships at that University. Other activities include scholarships in Catholic colleges, correspondence courses for members and their families and in hospital, emergency, relief, and employment work. The Order publishes a magazine *Columbia,* of general informative value and commanding public attention.

KNIGHTS OF LABOR, a national labor organization, was founded in 1869 by Philadelphia Garment Workers. Membership was later extended to include persons over 16, except employers in the manufacture or sale of intoxicating drinks, bankers, professional gamblers and lawyers. Women and farmers were admitted.

The Knights attempted to bring together in one national industrial union all existing American labor organizations. The time of its inception was opportune and the organization grew rapidly until 1886 when it numbered 600,000 members.

Its government was highly centralized. The governing body was a general assembly subordinate to which were national trade, state, district and local assemblies. The organization was unique in the idealism of its aims and its conception of the solidarity of the working class. The goal of the Knights in the early part of its career was a cooperative commonwealth in which industrial and moral worth should be the standard of greatness. Their objective was the improvement of the working class as a whole, rather than for a more or less exclusive group as in the craft unions. Its motto was "an injury to one is the concern of all."

This combination of SOCIALISM and political reformism proved to be an unsound basis for the formation of a union and, torn by STRIKES, political entanglements, costly cooperative ventures, difficulties with the craft unions and internal dissension, the idealism of the Knights gave way to the more practical, opportunistic American Federation of Labor which offered the workers immediate and tangible benefits.

The membership of the Knights of Labor has greatly declined. The organization continues to function as a fraternal body, but it is no longer effective as a labor organization. *See also* TRADE ORGANIZATIONS.

P. F. B.

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KNIGHTS OF PYTHIAS, a secret society in the United States, founded at Washington, D.C., on Feb. 19, 1864. The chief organizer was Justus Henry Rothbone, who formed Washington lodge No. 1 and Franklin lodge No. 2. In 1868 the founders established the Supreme Lodge, Knights of Pythias of the World, which controls the governing bodies in the various States, while the latter control the individual lodges. The society motto is "Be generous, brave, and true," and members strive to promote the principles of friendship and charity. There are three degrees, page, esquire, and knight. Life insurance and other pecuniary benefits were extended to the members until 1930, when a separate insurance company was formed which has no connection with the parent organization. Outside of the United States there are lodges in Canada, the American Territories, and Australia. Homes are supported for aged or indigent members. In 1930 the membership was approximately 700,000. The Order of the Pythian Sisters was organized in 1888 for women relatives of Knights of Pythias.

KNIGHTS OF THE GOLDEN CIRCLE, before the Civil War, a secret society of Democrats devoted to southern interests and in particular to the extension of slavery; during the Civil War, a continuation of the previous society in the northern states, particularly in Ohio, Indiana and Illinois, whose object was the restoration of slavery in the Union. The society attempted an armed demonstration at Indianapolis in May 1863. The failure of that movement, and the exposure of the society's treasonable purposes, led to the disbanding of the Knights of the Golden Circle, and, after one abortive attempt at reorganization, the establishment of the SONS OF LIBERTY, 1864.

KNIGHTS OF THE ROUND TABLE, in the ARTHURIAN LEGENDS, the knights of King Arthur. The knights, numbering about 150, were called "of the Round Table" from the fact that they sat at a huge circular table which according to legend was made by Merlin the Magician and given by King Leodegraunce to Arthur when he married Guinevere. The Round Table is first mentioned in Wace's *Roman de Brut,* 1155.

KNIGHTS OF THE SWORD, a powerful crusading order established in Livonia in 1200.

KNIGHTS TEMPLAR, or Knights of the Temple, a military religious order named after the first headquarters of the order, the Crusaders' Palace in Jerusalem, the so-called Temple of Solomon. The order was first established in 1118, and received the approval of the Pope in 1128. Its principal purpose was to protect the thousands of pilgrims on the roads of Europe and Asia at that date, as they journeyed to the holy shrines in Palestine. Throughout the period of the Crusades it spread widely, and in Spain, France and England it became a wealthy and influential body. Its most active centers were at Acre, Palestine, Cyprus and at a commandery near Paris, where its men-at-arms were conspicuous in their uniform or habit, a white mantle inscribed with a large red cross. The membership of the Knights of the Temple consisted of knights, men-at-arms and chaplains, all of whom were grouped in commanderies, each with its own superior master, the whole order being ruled by a Grand Master. In 1307 the Knights Templar were charged with heresy and immorality by Philip IV of France, and were suppressed by the Council of Vienne in 1312.

KNITTING, the art of producing textile fabrics composed of loops of yarn drawn through each other. There are two generic types of such fabric; filling fabric in which a single yarn forms its loops crosswise of the fabric and warp fabric in which a multiplicity of yarns, one for each series of loops, form their loops vertically or diagonally to the fabric. The former will ravel and drop stitch while certain types of the latter will not ravel and are drop stitchless. Both of these fabrics have been produced by hand knitting, the former by the use of at least two hookless rods or needles and the latter by the use of one hooked needle, in which case the fabric produced is known as crochet.

Filling fabric was first produced by flat hand machinery in the 13th century, the first machine being credited to William Lee, of Loughborough, England. Lee's machines were specifically intended for the production of hosiery, which was shaped on the machine and formed into the finished stocking by sewing.

Warp knitted fabric was first produced by flat hand machinery, in about the 15th century. Such machines were first used to produce shawls, being later broadened in scope to produce all types of flat fabrics. Both flat filling and warp machines were constructed to operate by power in the 19th century.

The earliest type of knitting machine needles used were known as spring barb needles and are to-day used and known as spring beard needles. These needles have their shank formed of relatively thin wire, one to four inches long, and have at their upper end a long flexible hook, the depending end of which is capable of being buried in a depression or eye formed in the needle shank, in this manner permitting previously formed loops to be cast off the needles while retaining the new loops in their hooks.

Sometime in the 19th century, Woodward, an Englishman, evolved another type of knitting needle. This needle is known as the latch needle and is composed of a shank which terminates in a rigid, short hook. The shank is slotted for the reception of a short swinging member or latch, which is riveted free to swing in the shank of the needle, its free end being capable of covering or closing the hook. The opening and closing of the latch is by means of the previously knitted loop, either the loop or the needle being caused to move up and down at each loop forming operation.

There are in operation to-day four generic types of knitting machines. In the order of their importance, they are: circular, flat spring needle, lamb and warp machines.

In circular machines the needles are mounted in a cylinder and in most constructions of this type, the needles are cammed to move endwise, independent of each other, to successively engage with the yarn and form it into loops. These machines usually use latch needles, which are successively raised so that their latches clear the previously knitted loops, their hooks engaging directly with the feeding yarn, and thereafter the needles are successively drawn down, the loops on the shanks of the needles closing the latches, in this manner permitting the new yarn to be drawn, by the hook, through the loops.

Machines of this type are built in all diameters from two to 36 ins. and are extensively used in the smaller diameters for the production of seamless tubular hosiery, in which heel and toe pouches are automatically knitted integrally with the tubular fabric. A second set of needles operating at approximately right angles to the regular needles have also been added to produce what is known as rib fabric, both with and without heel and toe pouches.

Circular machines have also been built to a limited degree, with spring beard needles, the loops being formed either by feeding the yarn directly to the needles with mechanical means for causing the beards to be depressed in the needle eyes, or by employing "sinkers," operating at approximately right angles to the needles, to kink and measure the amount of yarn required for each loop and to thereafter have the needles draw these measured amounts of yarn through the previously formed loops. These circular machines are used to produce tubular fabric in any diameter up to 36 ins., the fabric being used directly as a tube or cut and later sewn into garments.

Another type of knitting machine extensively used is known as the flat spring needle machine. The construction universally in use to-day is known as Cotton's hosiery machine system and is used in all its essentials as invented by William Cotton in about 1864.

This machine in its present form is some 40 or 50 ft. long and is composed of 18 to 30 separate flat knitting units or sections, each having between 300 and 400 spring beard needles, rigidly fastened in a needle bar which is moved laterally and vertically in

conjunction with a like number of yarn measuring sinkers. A separate yarn for each needle section is guided to the sinkers by the reciprocation of yarn carriers, the sinkers kinking the yarn around the raised needles below their open beards; the needles thereafter descend en masse and when the tip of their beards are slightly above the fabric line, a lateral needle movement causes the needle beards to contact with a fixed pressing surface, thereby depressing the beards into the needle eyes, in this manner causing the new yarn to be locked within the flexible needle hook or beard. With the beards so closed and through a continued downward en masse movement of the needles, the new kinks of yarn are drawn through the previous course of loops.

The shaping of the flat fabric thus produced is accomplished in this type of machinery by automatically lifting the edge loops inwardly, the yarn carriers traversing a lessened distance, as the fabric is narrowed. While these machines are used almost exclusively for the production of what is known as full-fashioned hosiery, they have been and are in some cases used for the production of underwear and other garments. They are essentially constructed for the production of fine gauge hosiery, producing the highest quality of fabric, and are capable of shaping the stocking or other garment to any desired degree. When used for making hosiery, two machines are used —the legger which produces the leg of the stocking and the footer which produces the foot, the legs being manually transferred to the footer. Early in 1931, several manufacturers announced a single-unit full-fashioned machine, designed to perform both these operations on one machine, long the goal of inventors. The success of this development, in its present stage, is still debatable.

Another type of knitting machine which was originally invented by Lamb in the 19th century, is a flat machine constructed with two needle beds placed at an incline to each other, with the needle hooks crossing on a common center line. Latch needles are used and by feeding the yarn first to one set of needles and then to the other, it is possible to produce tubular fabric. These machines have had a somewhat limited use, as they have to date been constructed to use only latch needles and as latch needles cannot produce the desired even and regular appearing fine gauge fabrics.

Warp knitting machines have had very little recent development. The extent of their use is becoming less, due mainly to the fact that these machines have never been constructed to automatically shape the garment during the process of knitting. An endless variety of one width fabrics can be knitted, including fancy designs, LACE, net, imitation leather, plush and toweling. The machines are usually constructed from 5 to 14 ft. wide, with a single set of needles which usually move en masse, forming the yarns, of which there is usually one for each needle, directly into loops, the yarns being shogged laterally after each needle motion, so that each vertical wale of loops is tied to its adjoining loop, thereby producing a fabric the width of the needle group. These machines have also been built with the two flat sets of needles and are then known as Raschel machines.

Another type of warp machine is the Milanese machine. This is a flat machine 10 to 16 ft. wide, having a single set of needles, with two sets of warp yarns, there usually being one yarn of each set for each needle. M. C. M.

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KNOCKABOUT. *See* YACHT.

KNOLE (KNOLE PARK), the seat of Lord Sackville, situated near the market town of Sevenoaks (pop. 9,100), Kent, England. Originally owned by the Earl of Pembroke, Knole was purchased and rebuilt by Archbishop Bourchier in the 15th century; in 1586, having become a Crown possession, it was presented by Queen Elizabeth to THOMAS SACKVILLE, Earl of Dorset. The present structure, built on the site of the former mansion in the 17th century, contains many paintings and works of art.

KNOSSUS. *See* CNOSSUS.

KNOTGRASS, a name applied to various small herbaceous plants with swollen or knotlike joints, especially to the doorweed (*Polygonum aviculare*), the knawel (*Scleranthus annuus*), the whitlow-wort (*Paronychia dichotoma*), the joint-grass (*Paspalum distichum*), the false oat (*Arrhenatherum avenaceum*) and the red-top (*Agrostis palustris*).

KNOTS, a term having two meanings, first, a nautical distance as a knot equals 6080 ft. and second, tyings or fastenings made with rope.

KNOTWEED, the common name for a large genus (*Polygonum*) of plants of the buckwheat family. There are some 275 species widely distributed throughout the world but most numerous in temperate regions; about 60 species occur in North America. They are mostly annual and perennial herbs, some of which are common weeds; a few are aquatic, bearing emersed or floating leaves, and a small number are somewhat woody with erect or climbing stems. Usually the stems are conspicuously enlarged at the numerous joints, whence the name knotweed. Several species as the prince's-feather (*P. orientale*) and the Japanese knotweed (*P. Sieboldi*) are grown as ornamentals. The name is applied also to the knapweed (*Centaurea nigra*).

KNOW-NOTHING PARTY, also called the American Party, the name of three separate political organizations in the United States. The first, the only important one of the three, was founded in 1854. Its members, when questioned about their organization, invariably replied, "I don't know," and as a result they came to be called Know-Nothings. The principal aims of the American Party, which was at first a secret society, were to stop the flow of immigration to America, and to promote the exclusive choice of native Americans for political office. In 1856, it nominated ex-President Fillmore for the presidency. He received eight electoral votes. After

1856, the party declined rapidly and ceased to be a factor in politics. In 1876, and again in 1888, the name American Party was utilized by political organizations having widely different principles. One advocated teaching the Bible in public schools, observance of the Sabbath day, prohibition of intoxicating beverages and abolition of secret societies. The principal aims of the other were restriction of immigration, and a high protective tariff.

KNOX, HENRY (1750-1806), American soldier, was born at Boston on July 25, 1750. While a bookseller in Boston, he became an officer in a military company, and studied artillery maneuvers. In the Revolution he was assigned to fortify Boston; as chief of artillery he helped to evacuate Boston, and took part in several major battles. He was at Valley Forge in 1777-78, and served against Cornwallis in 1781. The next year he became a major-general, and in 1783 was given the task of disbanding the army. In 1785 he was appointed head of the war department by the Confederation Congress, and was named to the same post by Washington when the new government was organized under the Constitution. He founded the society of officers of the Revolution called the "Cincinnati." He also proposed a federal militia. In 1795 he resigned his post as Secretary of War. He died at Thomaston, Me., on Oct. 25, 1806.

KNOX, JOHN (c. 1505-72), Scotch religious reformer and historian, was born near Haddington, Scotland, between 1505 and 1513. He was educated at Haddington and Glasgow and was distinguished in debate. He was ordained in 1530 and taught at St. Andrew's. At this period a gap of twelve years occurs in his life of which nothing is known. In 1545, coming under the influence of George Wishart, later martyred at St. Andrew's, Knox joined the Reformation movement. When St. Andrew's was taken by the French in 1547, he was condemned for two years to slavery in the French galleys. Returning to England, he preached chiefly at Berwick and Newcastle. When Mary Tudor came to the English throne, he fled to the continent until 1559. At this time he wrote much, including his *First Blast of the Trumpet against the Monstrous Regiment of Women.* On his return he preached vehemently against Rome, and the Scotch Queen, stirring large congregations in defense of the freedom of conscience, which led to events involving the dethronement of Mary Stuart and the establishment of Presbyterianism in Scotland. His chief literary work is the *Historie of the Reformation in Scotland,* covering the years 1558 to 1567. The Regent Morton said that Knox was "a man who never feared the face of men," but he is even more famous for the stern and unsparing speeches made before the face of Mary, Queen of Scots, which made even Randolph, the English envoy exclaim, "I commend better the success of his doctrine and preachings than the manner of them." Knox died Nov. 24, 1572.

KNOX, PHILANDER CHASE (1853-1921), American statesman, was born at Brownsville, Pa., May 6, 1853. He was educated at Mount Union College, and in 1872 began the study of law in the office of H. B. Swope at Pittsburgh. In 1875 he was admitted to the Pennsylvania bar and began practice at Pittsburgh. He was also Assistant United States Attorney until 1877 when he entered partnership with James H. Reed. This partnership, which lasted until 1902, soon became one of the most prominent law firms in the country, and Knox was considered one of the greatest corporation lawyers, representing many of the largest corporations. As a prominent Republican McKinley offered him the Attorney Generalship in 1897. Knox declined at that time, but four years later accepted a second offer and held this position until his appointment in 1904 as Senator from Pennsylvania to fill the vacancy caused by the death of Senator Quay. Knox was the first Attorney General called upon to prosecute important cases under the Sherman Anti-Trust law, winning decisions in the Northern Securities (Northern Pacific-Great Northern merger) and the Packing House cases. He was elected to the Senate in 1905 and in 1909 became Secretary of State, continuing in that office throughout Taft's administration. His energetic support of our commercial and financial interests, especially in the Near East and the Orient, was widely publicized as "dollar diplomacy" by that section of the press which was critical of state department policies. From 1913 to 1917 he lived in relative retirement and in the latter year was reelected to the Senate. He died in Washington, D.C., Oct. 12, 1921.

KNOX COLLEGE, a coeducational and privately endowed institution at Galesburg, Ill. Originally it was affiliated with both Presbyterian and Congregational churches but for many years has had no denominational affiliations. The foundation for the college was laid by a colony at Whitesboro, N.Y., in 1836. Its first name, Prairie College, was changed in the charter to Knox Manual Labor College, and in 1857 to Knox College. In 1930 Lombard College, also in Galesburg, was merged with Knox. The college had productive funds in 1931 amounting to $2,079,146. The library of 35,000 volumes contains the Finley collection of books and documents relating to the early French and English period in the Mississippi Valley. In 1931-32 there were 787 students and a faculty of 42, headed by Pres. Albert Britt.

KNOXVILLE, a city in eastern Tennessee, the county seat of Knox Co., situated on the Tennessee River, 160 mi. east of Nashville, and it is served by three railroads, bus and truck lines and river craft. The Great Smoky Mountains and the Cumberland ranges lie on either side of the city, which is the gateway to Great Smoky Mountain National Park. The region is rich in zinc, coal, iron and copper, and produces tobacco, fruit and grain. Knoxville's chief industries are railroad shop work and marble, furniture and cotton textile manufacture. The factory output for 1929 was worth about $60,000,000. The wholesale trade proper amounted to $31,947,404 in 1929,

and the retail trade to $55,887,892. The city is the seat of the University of Tennessee, Knoxville College for Negroes and the Tennessee School for Deaf and Dumb. A national cemetery containing nearly 4,000 graves is situated here. Knoxville was founded in 1786. It was chartered as a city in 1815. Pop. 1920, 77,818; 1930, 105,802.

KNOXVILLE, SIEGE OF, Nov. 17-Dec. 4, 1863, the unsuccessful campaign of a Confederate force of 20,000 troops under Gen. Longstreet to dislodge a Federal army under Gen. Burnside. Longstreet invested the city, but on Nov. 29, at the news of the Confederate defeat at Chattanooga (*see* CHATTANOOGA, BATTLE OF), abandoned his policy of delay and made a desperate assault. Before the parapets of Burnside's fortifications 1,000 Confederate soldiers were lost, without gain; Union casualties were about 15. Harassed by dissension among his officers and unable to prevent supplies entering the city, Longstreet welcomed the orders from the Confederate capital to withdraw. Burnside's loss in the several skirmishes incident to the siege was about 650 men; Longstreet's, about 2,000.

KNOXVILLE COLLEGE, at Knoxville, Tenn., a privately controlled coeducational institution for Negroes, founded in 1875 with the aid of the United Presbyterian Church. It maintains preparatory, collegiate, normal, theological, industrial and music departments. The productive funds in 1931 were $642,000. The library contained 10,000 volumes. In 1931-32 there were 279 students and a faculty of 16, headed by Pres. James F. Griffen.

KNUDSEN, JAKOB CHRISTIAN LINDBERG (1858-1917), Danish novelist, was born at Rödling, in Slesvig, Sept. 14, 1858. He began life as a teacher in a Folk High School and afterwards became a clergyman. His literary career did not begin until he was 40, and his first success came with the novel, *The Old Parson.* His other novels include *Ferment, Clarification, Grit, Inger, Progress, Schoolmaster Urup, Two Generations, Fear* and *Courage.* Knudsen depicts peasant types, and his novels chiefly deal with problems of religion and life. His short stories have been collected under the title, *Jutlanders.* He died at Birkeröd, Jan. 21, 1917.

KOALA, an Australian marsupial (*Phascolarctus cinereus*); called also native bear. It is an arboreal animal about 2 ft. in length, resembling a little bear in its compact, tailless, thickly furred form, ash-gray in color. It spends a sluggish life in trees, subsisting mainly on eucalyptus leaves, but at night descends to the ground and scratches up edible roots. Its flesh was eaten by native Australians. The Koala is an inoffensive animal that makes an affectionate pet; it is in danger of extermination.

KOASATI, a North American Indian tribe speaking the Upper Creek dialect of the Muskhogean linguistic stock. They are practically the same as the ALIBAMU and appear to be a major division of that group. Late in the 18th century they inhabited a single village on the Alabama River where the town of Coosada, Ala., now stands. After moving down the river and then returning to their original home, they crossed the Mississippi and, moving to the east bank of the Sabine River in Louisiana, dispersed over eastern Texas as far as the Trinity River. One group, however, remained in Alabama, moving with the Alibamu late in the 19th century to Indian Territory, where they now form part of the Creek Nation.

KOBE, the second most important open port in Japan and capital of Hyogo Ken, situated on the southern coast of Honshu Island. A long range of green hills rises behind the city on the land side, and the harbor faces the Inland Sea. The Island of Awajishima lies at a short distance across the narrow straits. Opposite Kobe in the hazy distance over Osaka Bay stand the hills of Kyushu. On the outskirts of Kobe are long sandy beaches and groves of old Japanese pines. In the city itself are modern streets, waterworks, electric tramways and extensive harbor works.

Since 1868, when Kobe was opened to foreign trade, it has grown to be one of the two greatest open ports in Japan. Practically all steamers, foreign as well as Japanese, call at the port. Some make it the last stop eastward in Japan on the route from the United States and Canada to China, and the first on the westward return trip from Shanghai. The center of travel for western Japan, Kobe drains the interior for exports. Its chief industries are in jewelry, real and imitation pearls, and crystals, as well as bamboo work, silks and curios. A boost was given to the trade of Kobe by the earthquake of 1923, which destroyed most of Yokohama and diverted exports and imports to its rival.

Among the chief points of historical and tourist interest is Minatogawa or Nako Shrine, dedicated to Kusunoki Masashige, a brave warrior of the loyal army in the mutinous times of the first half of the 14th century. About three mi. from the Sannomiya Station is Mount Mayo, standing 2,290 ft. high. Pop.

KOCH, ROBERT (1843-1910), German bacteriologist, born in Klausthal, Hanover, December 11, 1843. He studied medicine at Göttingen, with Jacob Henle, whose theory of contagion probably started Koch on his life-work. After serving in the Franco-Prussian War, he became district physician at Wollstein, where he began his microscopic studies. In April, 1876, he reported having obtained a pure culture of the bacillus of anthrax, and seven years later announced a method of preventive inoculation against this disease. Koch demonstrated his method of growing bacteria outside the body at the International Medical Congress, London, 1881. In 1882, he isolated the bacillus of tuberculosis. In 1900, Koch announced his view that the bacilli of bovine and human tuberculosis were not identical, claiming that there is little danger of transmission of the bovine type to man. Koch was undoubtedly one of the greatest bacteriologists ever known, and one of the greatest men of science his country ever produced. He is recognized as a pioneer

in new methods of bacteriological work. Koch was the recipient of many honors, among them being the Nobel prize in 1905. He died of heart failure on May 27, 1910, at the age of 67. M. F.

KOCHER, EMILE THEODOR (1841-1917), Swiss surgeon, was a native of Berne, Switzerland. He was a pupil of Langenbeck and Billroth, and after studies in surgery at Berlin, Paris and London he returned to practice surgery in his native town. He became connected with the University of Berne in 1866, being appointed professor and director of the surgical clinic in 1872. Kocher was noted for his method of reducing dislocations of the shoulder-joint, for his contributions on hernia, osteomyelitis, his operation for artificial anus, his theory of the effect of gun-shot wounds, and especially for his work on the thyroid gland. He was the first to excise the thyroid for goiter, and performed this operation on a large scale, with a mortality of only 4½ per cent. In 1883, he published his description of operative myxedema, which he found in 30 out of his first 100 thyroidectomies, and which, in connection with the pioneer experiments of other scientists, inaugurated the physiology and physiologic surgery of the ductless glands. Kocher also applied experimental surgery to the physiology of the brain and spinal cord. In 1912 he conceived the idea of injecting sterilized coagulen to accelerate coagulation of the blood in internal hemorrhage. Kocher died in Berne, July 27, 1917. M. F.

KOHATH or **KEHETH,** mentioned in the genealogical, or as some hold the ethnological, tables of the Book of Genesis, as the second son of Levi. He is said to have lived 133 years. Nothing is recorded of him personally; but his descendants, known as the Kohathites, were the largest and most important of the three great branches of the Levites and had charge of carrying the ark through the Sinaitic wilderness. Their cities were in Ephraem, Dan and half of Manasseh.

KOHLER, KAUFMANN (1843-1922), American rabbi and theologian, was born at Fürth, Bavaria, in 1843. He was descended from a family of scholars and distinguished rabbis. Kohler received his Jewish and academic training in Germany. In 1868 he received the Ph.D. degree from the University of Erlangen, and began to contribute to various learned publications. His *Segen Jacob's* was a bold venture in Biblical criticism. Shortly after its publication he arrived in America, and in 1869 became the rabbi of Detroit, Mich.; thence he went to Chicago, and in 1879, he was called to the pulpit of Temple Beth El, New York. From 1903-21 he served as President of the Hebrew Union College, Cincinnati, O. Throughout his rabbinical career Kohler championed the cause of liberal Judaism and was one of its most distinguished leaders. A prolific writer and outstanding preacher, he contributed hundreds of articles to various learned publications in many languages. His *Jewish Theology* has gone through several editions while his other works, too numerous to be mentioned, enjoy wide popularity. Kohler died in 1922. J. Bl.

KOHLRABI (*Brassica caulorapa*), a stout biennial of the mustard family, closely allied to the cabbage, grown as an early spring or autumn vegetable. The short stem enlarges just above the ground into a fleshy edible tuber. This gives rise to thin, long-stalked, irregularly toothed leaves, whitish-yellow flowers, borne in long clusters, and short-beaked pods. The tubers, which resemble turnips in flavor and texture, are stewed and eaten; the stems and leaves are utilized as stock food. Kohlrabi is of limited cultivation in the United States.

KOHUT, ALEXANDER (1842-94), American rabbi and Orientalist, was born Apr. 22, 1842, at Telegyhaza, Hungary. He received his academic and Jewish training in his native land, Hungary, and in Germany. Upon receiving the doctor's degree from the University of Leipzig, he became a frequent contributor to many learned periodical publications, and crowned his career in literature and scholarship with the publication of a monumental dictionary of the Talmud entitled *Aruch Completum,* 1878-92. To its preparation and production he devoted 25 years of his life.

After a brilliant career in his native land, where he rendered distinguished service as a preacher and teacher, he was called in 1885 to the rabbinate of the Central Synagogue of New York. Here he propounded a theory of Judaism aimed at the historic continuity of Jewish traditions and values. Kohut was a founder of the Jewish Theological Seminary of America and its first professor of Talmud. In his memory a collection of *Semetic Studies* was issued in Berlin, 1897, and the Alexander Kohut Memorial Foundation was established in New York in 1922. Kohut died at New York, May 25, 1894. J. Bl.

KOKOMO, a city in north central Indiana, the county seat of Howard Co., situated on Wildcat Creek, 50 mi. north of Indianapolis. Its transportation facilities include the Pennsylvania and the Nickel Plate railroads, an airport and bus lines. Kokomo's industries include steel mills, wood-working establishments, paper and pulp mills and rubber and automobile plants. In 1929 the manufactures amounted approximately to $34,000,000; the retail trade was valued at $15,584,147. It is also an agricultural trading center. Elwood Haynes, maker in 1892 of the first gasoline-driven automobile, was born here. In 1842, Kokomo was a trading post, established on land purchased by David Foster from the Miami Indians; 40 acres of this he gave for the original town site. Kokomo became the county seat in 1844, and a city in 1865. Pop. 1920, 30,067; 1930, 32,843.

KOKO NOR, a lake in Tibet near the Chinese frontier; area, 1,630 sq. mi.; maximum length, 67 mi.; altitude above sea level, 10,700 ft. The lake fills a depression surrounded by mountains, and its waters are very salty. There is a Buddhist monastery on one of its five islands.

KOLÁČEK, FRANTIŠEK (1851-1913), Czech physicist, was born in 1851. He studied at Prague and in 1882 became lecturer at the Brunn Polytechnic

and in 1891 was appointed professor of mathematical physics at Prague. Developing a series of equations covering the behavior of electrical currents through an object in motion, the equation not depending upon the electronic hypothesis, he established coordinates related to the observer as required by the relativity theory. He died in December, 1913.

KOLBE, GEORG (1877-), German sculptor and lithographer, was born at Waldheim in Saxony, Apr. 15, 1877. He studied in Munich, Paris and Rome, and established himself in Berlin. He excels in executing figures in movement, and stands in the first rank of German sculptors. Among his best known works are *Tanzerin,* a dancing figure; *Naiad; Frauenraub; Assunta; Guerrier et Genie;* monument to Beethoven; *Adam; Lucino,* and *Aufwartsschreitende.*

KOLBERG, a Baltic Sea harbor and popular watering place at the mouth of the Persante in the Prussian province of Pomerania. There is a rathaus, a 13th-century Gothic cathedral, some statues and hotels in the town and along the beach. The town was a member of the Hanseatic League at the end of the 13th century; it was attacked by the French in 1806-07 and successfully defended itself. Its industries include mining and fishing. There were 16,500 visitors in 1925. Pop. 1925, 30,276.

KOLCHAK, VLADIMIR VASILIEVITCH (1874-1920), Russian admiral and anti-Bolshevist leader, was born in 1874. In the Russo-Japanese War (1904-05), he rendered distinguished services with his mine-destroyers in the siege of Port Arthur. In the World War as rear-admiral, he commanded the Baltic fleet against the Germans and later, as vice-admiral, the fleet in the Black Sea. With the fall of the empire in 1917, Kolchak, with the support of Great Britain, formed an anti-Bolshevist army in Siberia and became virtual ruler of Russia (Nov. 18, 1918), with headquarters at Omsk. But Allied support being discontinued, he gradually lost his followers. Omsk was captured, Nov. 15, 1919, by the Bolshevists and he had to transfer his headquarters to Irkutsk. On Jan. 4, 1920, the remnants of his army forced his resignation and he was later taken by the Bolshevists after the capture of the city and shot, Feb. 7, 1920.

KOLCSEY, FERENCZ (1790-1838), Hungarian poet, was born at Szodemeter, Transylvania, Aug. 8, 1790. Devoting himself to literature and politics, he became a member of the Hungarian Diet during 1832-35. He had already gained considerable fame by four volumes of critical essays in his periodical, *Life and Literature,* 1826-9. Kolcsey is better known, however, for his ballads, songs and lyrics. Notable among these are *National Hymn* and the ballad, *Beautiful Lena.* He ranks among the great Hungarian poets. Kolcsey died in Pest, Aug. 4, 1838.

KOLHAPUR, a town and native state in the DECCAN division of Bombay, India. The town, a noted religious center, is the headquarters of the state and the terminus of the state railway. It manufactures chiefly cotton and woolen goods, hardware and pottery. The State of Kolhapur, bounded on the west by the Western Ghats Mountains and on the east by the plain of Deccan, produces rice, sugar cane, millet and some iron ore and timber. Area 3,217 sq. mi. Pop. 1921, town, 55,594; state, 833,726; 1931, state, 956,864.

KÖLN. *See* COLOGNE.

KOL NIDRE ("All the Vows"), the introductory prayer of the service for the evening of the Day of Atonement, or Yom Kippur. The name is taken from the two opening Aramaic words of the prayer. The content of the Kol Nidre is a prayer to the effect that all the vows which one makes during the course of the year be declared void and invalid, but only such as affect the person himself. It owed its origin to the tendency prevalent in ancient Israel to make all sorts of vows, mostly trivial and hasty ones, a characteristic which was persisted in by medieval Jewry, despite the efforts in the Pentateuch to reduce vows to a necessary minimum. It is not known exactly when the Kol Nidre was written and incorporated in the prayer-book, but the general belief is that it was composed somewhere outside of Babylonia during the first few centuries of the Gaonic period, from 600-800.

In its original form the Kol Nidre declared as null and void the vows which had been made during the year just past. However, Jacob ben Meir Tam (Rabbenu Tam), in the 12th century, changed the formula to refer to future vows, vows to be made during the course of the coming year.

To-day, however, the Kol Nidre seems to have lost all legal or personal significance, and is chanted purely as a historical and ancient prayer-motif, without any thought or reference to its original content and meaning, especially since the making of vows has long since ceased to be a characteristic of the Jewish people, as it was in the days of the Bible, Mishna and Talmud. Reform Jewish congregations of to-day retain the traditional melody of the Kol Nidre at the beginning of the service for the evening of the Day of Atonement, but have eliminated the ancient text itself, with the result that it is only the melody, and not the words, which have acquired solemnity and sanctity in modern times. A. SH.

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KOLOMEA or **KOLOMYJA,** a city in the Polish voievodship of Stanislawow, on the Pruth River in a fruitful plain, 120 mi. southeast of Lemberg. The city has Roman Catholic, Greek and Protestant churches, advanced and vocational schools. Kolomea is an important commercial center of Eastern Little Poland. There are ceramic, chemical and textile industries, and trade in grain. During the World War the city changed hands several times. Pop. 1931, 33,385.

KOLOMYJA. *See* KOLOMEA.

KOLUSCHAN, a North American Indian linguistic stock, better known as TLINGIT.

KOMINTERN, abbreviation for the Russian *Kommunisticheski Internatzional* or Communist International. The Third, or Communist, International was officially formed at Moscow on Mar. 2, 1919 with the avowed purpose of uniting workers and peasants against capitalism. The Third International exacts from all its members implicit obedience to party dictates. Each national Communist Party is directed by a Central Committee which in turn is subordinate to the Executive Committee in Moscow. The supreme authority within the party is its World Congress held at irregular intervals. Smaller executive organs meeting more frequently than either the Congress or the Executive Committee are the Presidium, of 29 members, and the Political Secretariat, of 13 members. By virtue of its numerical strength, the All-Union Russian Communist Party necessarily wields the dominant influence in the Komintern. The permanent staff of the latter includes some 4,000 employees, of whom over half are foreigners. It is divided into regional sections and into commissions for the study of specific problems and the promotion of special aims. While Russian authorities endeavor to distinguish between the policies of the Komintern and those of the Soviet State, the facts, that outstanding Russian Communists are its officers and that every prominent Russian official is a Communist, imply that no permanent deviation in political theory is possible. Competent non-Russian observers concede, however, that there is no evidence to indicate that the Komintern is subsidized by the Soviet Treasury, though the dues of Russian Communists obviously figure largely in its resources. S. H. C.

KOMOTAU. *See* CHOMUTOV.

KOMURA, IUTARO, MARQUIS (1855-1911), Japanese statesman, was born at Tokyo, Nov. 23, 1855. Becoming a Minister of State he participated in the negotiations closing the Sino-Japanese War and in 1905 as Minister of Foreign Affairs was one of the signers of the Portsmouth Treaty with Russia. He died at Tokyo, Nov. 24, 1911.

KONGMOON, or "River gate," a treaty port in the West River, a creek about 30 mi. inland, but the customs house is on the West River, 2 mi. distant. The chief exports are palm leaf fans, tobacco, paper and joss sticks. Kongmoon was opened to foreign trade by the Mackay Treaty in 1904. Steamers run to Hongkong on the coast, 87 mi. above and railways connect the city with the fertile district of the south. Pop. 1929, 94,598.

KONIA or **KONIEH,** a city of Asiatic Turkey, capital of the Konia vilayet and situated about 150 mi. south of Ankara. Railways connect it with Istanbul, Izmir and Baghdad. The town is surrounded by walls, now dilapidated, which were erected by the Seljuk sultans in the 11th century. Besides many remains of Seljuk architecture, Konia contains a monastery of dancing dervishes in which is buried its founder.

In ancient times Konia was known as Iconium. A famous church council met here in 235, and before this date Paul and Barnabas had preached in the streets. Captured in 1063 by the Seljuk Turks, the city was made capital of the Iconium Sultanate. Frederick Barbarossa invaded Konia in 1190 and Mohammed II took it for the Ottoman empire in 1472. In 1832 the town was invested by the forces of Ibrahim Pasha of Egypt. Pop. 1927, 102,906.

KÖNIG, KARL RUDOLPH (1832-1901), German physicist, was born at Königsberg, East Prussia, Nov. 26, 1832. In 1851 he went to Paris and devoted himself to problems of acoustics. He discovered the graphic method of recording sound waves and studied the speed and refraction of sound waves. He made many minor inventions, including tuning-forks of remarkable accuracy, of great value in acoustical work. He died at Paris, Oct. 2, 1901.

KÖNIGGRÄTZ. *See* HRADEC KRÁLOVÉ.

KÖNIGGRÄTZ or SADOWA, a battle between the Prussians and Austrians, fought near the Elbe River in Bohemia on July 3, 1866. The first Prussian army, united with that of the Elbe under William I, engaged the main Austrian army, occupying a strong position in a triangle between the fortress of Königgrätz, the Elbe and the Bistritz brook, in a severe but indecisive battle during much of the day. In the afternoon, the second Prussian (Silesian) army under the Crown Prince, after an exhausting march, gained the flank and rear of the Austrians, enabling the Prussians to win a complete victory. The battle proved to be decisive, not only in ending the war, but in opening the way for the reconstruction of Germany under Prussian leadership.

KÖNIGSBERG, a German city, capital of East Prussia, situated on hilly ground along the Pregel River, about 5 mi. from its mouth. The trade consists chiefly of grain (the city has the largest grain silos on the continent), lumber and groceries, and has been facilitated by a canal since 1901. The most important industrial plants are grain mills, iron foundries and machine factories. Since 1920, there have been two trade fairs annually, and the great East German Fair is held there each year. Königsberg originated as a stronghold of the Teutonic Order. After the fall of the Marienburg, the grand master resided in Königsberg and later, from 1525 to 1618, his successors, the dukes of Prussia. Königsberg belonged to the Hanseatic League at the middle of the 14th century. It was the birthplace and home of Kant. Its buildings include a massive palace, founded by the Teutonic Order in 1255; a cathedral, begun in 1325; and a university, founded in 1544; fine monuments and squares dignify the city. Pop. 1925, 279,926.

KÖNIGSHÜTTE or **KROLEWSKA HUTA,** city in the Polish voievodship of Silesia. Like KATOWICE, Königshütte developed only in the second half of the 19th century. It was formerly a small settlement, part of the village Lagiewniki. The Royal foundry erected by the Prussian government in 1798 and the cause of Königshütte's development, is the largest industrial establishment in all Polish Silesia.

The Royal foundry possesses also the largest coal pit in Silesia, called the "President." Besides this foundry Königshütte has many smaller foundries and pits, and trades in grain, lumber and cattle. There are advanced schools and hospitals. Est. pop. 1930, 90,003.

KONOMIHU, a sub-tribe of the North American Indian SHASTA tribe, differing dialectically from the main group. They lived on the branches of the Salmon River in Siskiyou Co., Cal.

KONRAD OF WURZBURG (d. 1287), Middle High German poet, was born probably at Wurzburg in the first third of the 13th century. He lived most of his life in Strassburg and Basel, writing much of the best of Middle High German poetry. His most famous work, *The Trojan War,* was finished by some unknown writer. Other classical material furnished Konrad the basis for his *Alexius,* while from the French legends of Amor and Psyche he drew his *Partonopier and Meliur,* a fairy romance. Christian, Celtic and old Germanic figures and stories are worked up in many of his other poems. The bulk of Konrad's writings have been issued in modern German editions. The poet died at Basel, Aug. 31, 1287.

KONSTANZA. *See* CONSTANTA.

KOO, V. K. WELLINGTON (1887-), Chinese diplomat, was born in Shanghai. He studied at Columbia University, receiving the degrees of B.A., 1908, M.A., 1909, and Ph.D., 1912. In 1916 he was given an honorary LL.D. by Yale University. He served as Minister to the United States in 1915, being at the time of his arrival the youngest diplomat ever to have represented a foreign country in the United States, and subsequently represented China in Great Britain and at the Paris Peace Conference, the Washington Conference and on the League of Nations Council. Returning to China in 1922, he served as Minister for Foreign Affairs from the fall of that year until 1924, being acting premier part of the time. In 1926 7 he was acting premier of the regency cabinet. After the overthrow of Chang Tso-lin by the Nationalists in the summer of 1928, he was in retirement for a time and lived in Mukden as he had been proscribed by the Nationalist Government. He was the foreign affairs adviser to the Manchurian administration, and upon the resignation of C. T. Wang (*see* WANG, C. T.) was Minister for Foreign Affairs for China in the autumn of 1931, was appointed to this post at Nanking, resigning after a short time when the government was reorganized at the end of the year.

KOOTENAY PARK, a Canadian national park near Firlands in British Columbia, adjoining ROCKY MOUNTAIN and YOHO national parks on the north. The park was established Apr. 21, 1920 and has an area of 587 sq. mi. It is primarily a National Highway Park extending in a 10 mi. wide strip for approximately 60 mi. along the Vermilion-Sinclair section of the Banff-Windermere Highway which, on its completion in May 1929, constituted the final link in the 5,000 mi. "Grand Circle Tour" embracing Vancouver, San Francisco, Los Angeles, the Grand Canyon, Yellowstone, Banff, Lake Louise and other points. Kootenay Park is situated in magnificent mountain country with glaciers, an ice lake, rivers, waterfalls and vast stretches of virgin forest. Abundant numbers of bear, deer, caribou and mountain sheep are protected by game laws. Radium Hot Springs in the southern portion with radio-active springs, the healing properties of which were known to the Indians, is a popular resort. The park is also reached from Park Gate on the Canadian Pacific railway.

KOPECK, or copec, a small bronze Russian coin, 100 of which are equal to one ruble. A kopeck is equivalent to about one-half cent in U.S. money.

KOPRULU, KUPRULU. *See* VELES.

KORAN, or Qur'an, meaning reading, the chief holy scripture of Islam (*see* MOHAMMEDANISM), containing the revelations of MOHAMMED, written in 77,639 words of the divine language, Arabic. It contains 114 suras, or chapters, ranging in length from the 15 words of sura 112 to the 276 verses of sura 2. Sura 112, The Unity, however, is said to be equal in value to one-third of the entire Book, a rhetorical emphasis upon the primacy of the doctrine, "there is no God but Allah." As a book the Arabic Koran is merely a record of what is contained in the well-guarded, heavenly tablet read bit by bit by Gabriel to the listening Mohammed. The revelations came as the need arose, and dealt with all manner of subjects, religious, moral, economic and political. Mohammed himself never wrote down what he received; he only recited from memory. His adherents either remembered it, or wrote it down. In time, the revelations were received from the year 610 (sura 96: 1-5) to the end of the Prophet's life, 632. Shortly after his death a compilation was made of all the Prophet's inspired utterances, without reference to logical arrangement or historical order. About 658 a final recension of the Book was made, but with reference to exact phraseology only. The Book has stood unchanged since.

In the Moslem view the Koran supersedes all previous Scriptures and represents God's final word to mankind. To the Western, non-Moslem, however, the work seems crude and unedifying. The sympathetic student may cull from its midst many choice passages, which reflect the sincere efforts of the author to express wholesome ideals. Some verses are melodious to the ear, and many are ennobling to the mind. Out of the Book's heterogeneous supplies have been drawn elaborate systems of theology and jurisprudence, and not until recently has there appeared any disposition on the part of Moslems to examine critically its structure and its message, although there have been variant interpretations (*cf.* the four schools of Canon Law) within the limits of orthodoxy. It is not surprising that portions of the Koran have always been used among the masses for their magic virtues. In a Sunni mosque Koranic passages are the sole decoration. J. C. A.

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KORE. *See* PERSEPHONE.

KOREA, the country, stretching southward from Manchuria, which was annexed by Japan in 1910, and given the name of CHOSEN.

KOREAN LANGUAGE, the language of Korea, perhaps best taken as constituting a distinct LINGUISTIC FAMILY, for although it is usually supposed to be connected with JAPANESE, with which it has several points of resemblance, the relationship is far from clear. As in Japanese, the verb is impersonal, and TENSE and ASPECT are indicated by affixes, some of which have become pure particles, while others have retained their original meanings (cf. AGGLUTINATION). Number and gender are lacking; and the relationship between words is indicated by postpositions which vary according to the consonant or vowel at the end of the root-word. The vocabulary also strongly resembles the Japanese, but probably includes Manchu (*see* TUNGUS) and MONGOL elements. A very strong influence is exerted by CHINESE, from which most words of advanced civilization used in higher style have been borrowed, this giving rise to a mistaken idea that there are two Korean languages. Chinese characters are used in writing, but a native alphabet, called *en-mun,* and based on a SANSKRIT alphabet, was invented in the 15th century, though formerly used only by the uneducated. J. J. L. D.

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KOREAN LITERATURE. The Koreans have a very high regard for *Keul* or literature. Even the illiterate will not step on a piece of paper where characters are written, but picking it up, will place it in some high place, such as on a tree. This symbolizes the sacredness of written words. The oldest printed book in the world, now in the British Museum, is a Korean book, showing that printing from movable types was first invented in Korea. While there are volumes of scientific works on agriculture, philosophy, astronomy, geography, medicine, law, military strategy and mathematics, the bulk of the literature consists of belles lettres and history, aphorisms and moral essays.

According to the *Ko Ki,* or "Ancient Record," the history of Korea goes back to 2333 B.C. when Dan Koon is said to have founded the kingdom. The *Ko Ki* was compiled by the Buddhist monk, Il-yun, some seven centuries ago. It treats of the genesis of Korea, and is based on legends and traditions written in Chinese. The ten books of this type, treating the ancient history of Korea, have a crude but real literary value.

The Dan Koon period lasted until Ki Ja, a Chinese sage, brought over Chinese culture in 1122 B.C. The literature of Korea was at its height at the time of the Three Kingdoms, Koguryu in the north (37 B.C.-668 A.D.), Pakje in the southwest (18 B.C.-660 A.D.) and Silla in the southeast (57 B.C.-935 A.D.) This period is contemporary with the golden age of Chinese literature. In the 6th century A.D. at the time of the great general and poet, Eul Chi Moon Duk, a doctor of letters, Li Moon Chin, compiled a Korean history in 100 volumes and 5 supplementary volumes. Many scholars were sent as teachers to Japan. At this time Kyungju, in southern Korea, was the literary center of Korea; Chinese, Hindu and Japanese students came here to study, and here the great poet Choi Chi Won was born in 858. There are 46 volumes of poetry extant written by him, and of essays there are many more. For 16 years he was a student in China and was influenced by the Chinese classics. The most famous poet of the Koryu dynasty, 918-1392, is Lee Kyu-Po. At this time Kim Pu-Shik, who wrote the history of the Three Kingdoms, also wrote the well-known *Story of the Long North Wall.*

During the Li dynasty, 1392-1910, there were many poets and philosophical writers, and by 1440, many novels. The best known novels are *The Adventures of Hong Kil-Dong,* by the monk Kasan, and *The Story of Kyongop,* by Ho Jong. By the 18th century, many famous novels, such as *A Dream at Keumsan Sa, The Story of Yi Ha-Ryong* and *The Golden Jewel* were written. Several authors were students in China, and they used a literary style full of Chinese allusions and classical quotations. But although all Korean literature of this time was written under the influence of the Chinese classics, the setting for most of the works was an idyllic Korean mountain scene, with the background one of Korean customs and Korean characteristics. At this time *Moon Hun Pi Ko,* the Korean national encyclopedia, was compiled.

Prior to the invention of the Korean alphabet, Korean poetry is not much different from Chinese poetry, while retaining a charm of its own. Its characteristics are chasteness, subtlety, and compression rather than exuberance.

During the 15th century the alphabet was invented by three great scholars, Dhung Inchi, Sung Sammoon and Sin Sook Choo at the command of the king, Se Chong Cho. From that time up to to-day, the outstanding poets and novelists have written in the Korean language with the Korean phonetic alphabet.

In Korean poetry, the outstanding feature is the use of nature and symbols to express a philosophical thought. Imagery and word-pictures are luxurious. But there is a thought, a question, a seriousness behind each. Hardly any line is a sheer outburst of emotional feeling. The attitude of certain poets toward old age and death is somewhat that of Walt Whitman. On the other hand, there are many poems on love and wine and women, expressing the Epicurean philosophy of Omar Khayyam.

The contemporary literature of Korea is more vigorous and inspired than the literature of her neighbors, China and Japan, owing probably to the agony she is undergoing in the loss of her racial heritage. Choi Nam Sun, an outstanding historian, wrote a masterly prose poem in the Korean Declaration of Independence. Lee Kwang Soo, the most significant novelist, has adapted the best known novel of old Korea, the *Chun Hyang Chun,* for popular consumption, besides

writing many of his own, *Moo-Chung* and *Dan Chong Sa.* The leading poets are Han Yong Woon and Choo Yohan. Y. K.

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KORIZA, also Kortcha and Korçë, a town of southeastern ALBANIA near the Greek frontier. The largest town in the Albanian kingdom, it adjoins a rich, level region. Granite and limestone quarries are found in the nearby mountains while the valley is rich in the cultivation of maize. The most important building is the cathedral of the Greek Orthodox metropolitan. Koriza is the residence of several European consuls. A Venetian possession as late as the 18th century, the town was taken by Ali Pasha for the Turks from whom it was not freed until the Balkan Wars of 1912-13 when the Greek army invaded it. Reluctantly the Greeks ceded it to Albania. The inhabitants consist of Albanians, Greeks, Vlachs and some Bulgarians. Carpets are woven in the homes of the people of Koriza, which is a trading center for lumber, leather goods, sheep, cattle and dairy products. A tobacco factory and flour mills are located here. Pop. 1930, 22,787.

KORNGOLD, ERICH WOLFGANG (1897-), Austrian music composer, was born at Brünn, May 29, 1897, the son of the foremost music critic in Vienna. He composed *Der Schneeman,* a pantomime, in 1908, *Violanta* in 1916, music to Shakespeare's *Much Ado About Nothing* in 1918, the opera *Die Tote Stadt* in 1920, and *Das Wunder der Heliane* in 1927. His compositions also include songs, chamber music, and orchestral works.

KORNILOV, LAVR GEORGIYEVICH (1870-1918), Russian soldier, was born at Ust-Kamenogorst, July 18, 1870. The son of a Cossack officer, Kornilov worked up through the commissioned grades of the Imperial Army, and after service in Turkestan, Persia, Afghanistan, Manchuria, and China, first participated in the World War as division commander in Galicia. Taken prisoner in May 1915, he managed to escape in 1916 and became a corps commander. Upon the outbreak of the March Revolution of 1917, command of the military area of Leningrad was offered him, but he rejected this to serve once more in the field. Appointed Commander-in-Chief by Kerenski to succeed Brussilov, he soon came into conflict with the Premier in consequence of Kerenski's unwillingness to enforce discipline in the army. While endeavoring to organize a counter-revolution, Kornilov was relieved of his command and interned. Released after the Bolshevist coup d'état of Nov. 1917, he was active in the formation and command of a section of the White Army, but was killed by a bomb at Iekaterinodor in the Caucasus, Apr. 13, 1918.

KOROA, a small North American Indian tribe speaking a language of the Tunican linguistic stock. Originally they lived on the western shore of the Mississippi, below the Natchez River, and between the Mississippi and the Yazoo. When first encountered by La Salle in 1682, they were a belligerent group, living in cane-covered, dome-shaped houses. Culturally they closely resembled the Taensa and Natchez, though these tribes differed from them dialectically. In the 18th century the Koroa with their allies, the Chickasaw, were merged with the Choctaw, thus losing their tribal identity.

KOROLENKO, VLADIMIR GALAKTIONOVICH (1853-1921), Russian poet and novelist, was born in Zhitomir, Volhynia, July 27, 1853. In 1879 he was exiled to Yakut, Siberia, for revolutionary activities. He lived at Nijni Novgorod from 1885-95, where he wrote his best stories. In 1900 he was elected to the Russian Academy and in the same year settled in Poltava. Korolenko's stories have as their background Siberia or the Ukraine and are very readable and full of delightful humor. The author died in Poltava, in Dec. 1921.

KOS. *See* Cos.

KOSCIUSKO, a mountain of the Australian Alps, attaining a height of 7,308 ft. above sea level and therefore being the highest point on the Australian continent. The mountain is in New South Wales, about 80 mi. from the coast of the Pacific, in the Muniong Range. Most of the year it is covered with snow. Since 1897 there has been a meteorological station on the summit.

KOSCIUSZKO, TADEUSZ (1746-1817), Polish general and patriot, was born in Minsk, Lithuania, Feb. 12, 1746, and after an intense military training in France and Germany, became a captain in the Polish army. He went to America to serve with the Colonial army in the Revolution and in 1786 returned home a general with ideas of a Jeffersonian democracy for Poland. In 1794 he led the nationalist movement at Krakow and Warsaw and by his brilliant leadership repelled the vastly greater forces of Russia and Prussia until the battle of Maciejowice when he was captured. Russia kept him a prisoner until the accession of Paul in 1796. His later efforts to obtain a constitutional government for Poland failed, and he died at Solothurn, Switzerland, Oct. 15, 1817.

KOŠICE (German *Kaschau*), a Czechoslovak city in eastern Czechoslovakia on the Hernád River. Among the many churches are the splendid early-Gothic cathedral of the 13th and 14th centuries founded by Queen Elizabeth of Hungary, and the Gothic St. Michael's Church of the 13th century. Other beautiful structures are the government building, city hall and the episcopal palace. There are fine parks, advanced schools, museums, and important and diversified industries. Originally a German settlement, Košice became a fortified city and was involved in many wars. Following the World War the city was given to Czechoslovakia. Pop. 1930, 60,042 (37,572 Czechoslovaks, 11,206 Magyars, 2,145 Germans, 5,275 Jews).

KOSLIN, a German city in the province of Pomerania, located in the eastern part of the province, about seven mi. from the Baltic. It has a Gothic church of the 14th century, an agricultural college

and other schools, machine, soap and paper factories and trade in grain and cattle. It embraced the Reformation and was practically wiped out in the Thirty Years' War. In 1720, it was rebuilt after a fire and was again devastated in the Seven Years' War. Pop. 1925, 28,834.

KOSSEL, ALBRECHT (1853-1927), German physiologist and biochemist, was born at Rostock, Sept. 16, 1853. In 1886 he became professor at Berlin, in 1895 at Marburg, and from 1901 to 1923 at Heidelberg. He worked upon the chemical nature of the albumins, and their reactions in the human body. His work upon the chemistry of the cell was of great consequence. He analyzed the chemistry of the cell nucleus, isolated the function of peptones, and discovered the nuclear acids. In 1910 he was awarded the Nobel Prize in chemistry. He died at Heidelberg, July 4, 1927.

KOSSUTH, LAJOS or **LOUIS** (1802-94), Hungarian patriot and revolutionist of noble family, was born at Monok, Hungary, Sept. 19, 1802. He studied at Budapest, where he began a law practice which he abandoned in 1832 to enter parliament as the representative of absent deputies. He circulated a secret Liberal newspaper, and in 1837 was arrested for publishing parliamentary proceedings. In 1840 Kossuth was released, and the following year became editor of the Pesth *Journal.* With this advanced organ as mouthpiece, he organized the National League, in opposition to the Vienna government, and in 1847 was elected to the Hungarian Diet. The following year he entered the Hungarian cabinet as finance minister. From this vantage-ground, he demanded Hungarian independence, and freedom for the peasants and press. He was the leading figure of the Magyar nationalist movement, and on overthrow of the Viennese democracy and the restoration of the Hapsburg rule he proclaimed the Hungarian Republic in 1849. Although successfully resisting the Austrians for a time, the Hungarians were crushed with the aid of a Russian army. Kossuth fled to Turkey, where he was imprisoned for a time. In 1851 he was released, went to England where he quickly learned the language and then went to the United States to raise funds for the cause of Hungarian independence. He died at Turin, Italy, Mar. 20, 1894.

KOSTROMA, the administrative center of the Ivanovo-Kostroma district, in the Industrial Region of the R.S.F.S.R., north central European Russia. The city is on the left bank of the Volga River. It is the center of the linen industry. Founded at the end of the 12th century, it was later invaded by Tatars. Independent for a time, it became part of Muscovy in the 14th century. There is a large metal working plant and extensive linen mills. The 13th century Cathedral of the Assumption and the State Regional Museum are interesting buildings. The headquarters of the communist party houses one of the finest halls in the Soviet Union. Across the river is the Ipatyevsky Monastery, where Michael Feodorovitch Romanoff was proclaimed czar in 1613. Pop. 1926, 69,252.

KOSZTA AFFAIR, 1853, a diplomatic controversy between the United States and Austria. Martin Koszta, Hungarian revolutionist, who had escaped to Turkey and subsequently to the United States, declared under oath his intention of becoming an American citizen. Before completing the process of naturalization he returned to Turkey, and at Smyrna was kidnaped by Austrian agents and confined in irons aboard the Austrian brig *Huszar.* The American consulate protested vainly. On July 2, 1853 Capt. Ingraham of the United States sloop of war *St. Louis,* then in Smyrna harbor, threatened to open fire if Koszta were not shortly released, and the Austrian consul-general agreed to parole Koszta to the French consulate until the matter should be settled. In August the Austrian chargé d'affaires at Washington addressed Secretary of State Marcy, asking that the United States disavow the conduct of its agents, "and tender to Austria a satisfaction proportionate to the magnitude of the outrage." Marcy replied, Sept. 26, 1853, vigorously maintaining the right of his Government to protect Koszta and upholding the interposition of Capt. Ingraham. Probably heedful of the enthusiasm greeting Marcy's letter in the United States, the Austrian Government released Koszta and permitted his return to the United States.

KOTZEBUE, AUGUST FRIEDRICH FERDINAND VON (1761-1819), German dramatist and journalist, was born at Weimar, May 3, 1761. He lived an adventurous life in the service of Russia and in 1817 was a Russian agent in Germany. In the course of a busy lifetime and in the midst of active political and journalistic work he produced more than 200 plays, many of them popular comedies that exerted an important influence on Continental drama and stage technique. He met his death by stabbing at Mannheim, Mar. 23, 1819.

KOUROPATKIN, ALEXEI NICHOLAJEVITCH (1848-1925), Russian general and aid-de-camp to the Czar, was born Mar. 29, 1848. He served with distinction in military operations and diplomatic missions and wrote a valuable critical history of the war against Turkey, 1877-78, in which he had taken part as chief of staff. In 1904-5 he was commander-in-chief of the Russian army in the Russo-Japanese War. In the World War he fought on the western front and in 1916, became governor general in Turkestan. After 1917 he was a teacher in a village school. He died Jan. 23, 1925. His account of the Russo-Japanese War was suppressed by the government. In 1923 he published *The Diary.*

KOZANI, a town in southeastern Macedonia, about 50 mi. from Monastir, under whose vilayet it was included until 1912. Upon the expulsion of Turkey from Macedonia, in that year, it fell into Greek hands and was made the seat of a nomarchy. It is a trading point for olive oil, hides, wool, red pepper and sheep and cattle. Pop. 1928, 12,702.

KOZLOV, administrative center of the Kozlov district in the Black Soil Region of the R.S.F.S.R., on the Liesnoi Voronezh River in south central Euro-

pean Russia. It is situated in fertile country. Kozlov is a railroad center and an export market for agricultural and dairy products. The city has several small factories, cold storage facilities and a grain elevator. It served as an outpost in the Russian struggle with the Tatars. Pop. 1926, 54,250.

KRAG, THOMAS PETER (1868-1913), Norwegian novelist, was born at Kragerö, July 28, 1868. He was a brother of VILHELM KRAG, the poet. His first novel, *Jon Graff,* was somber and tinged with mysticism, and his later works are in a similar vein. His prose is lyrical and at the same time solemnly ponderous. Among his novels are *The Brazen Serpent, Ada Wilde, Ulf Ran, Gunvor Kjald* and *Tubal the Outlaw.* Krag died at Oslo, Mar. 13, 1913.

KRAG, VILHELM ANDREAS WEXELS (1871-), Norwegian poet and playwright, was born at Christiansand, Dec. 24, 1871. Many of his poems have been set to music by Grieg and Sinding. Among his books of verse are *Poems, Songs from the South, Ballads and Verses* and *Songs from My Island.* His plays include *Life Is a Game* and *The Master of the Situation.* He is also the author of several novels.

KRAGUJEVAC. *See* KRAGUYEVATS.

KRAGUYEVATS, also known as Kragujevac, a town of Serbia, YUGOSLAVIA, situated on the Lepenetsa, a tributary of the Morava River, about 60 mi. south of Belgrade, with which it is connected by rail. Kraguyevats was taken from the Turks by the Serbian rebels in 1835, and during the first years of independence was the capital. The town which is strongly fortified has an infantry training school and an arsenal; interesting features are the fine cathedral, the library and the college. Iron works, canneries, flour mills and factories are the leading industries. Pop. 1931, 27,249.

KRAIT, a name applied to venomous elapine snakes of the genus *Bungarus,* native to southern Asia and the East Indies. The kraits are characterized by their banded color patterns, nocturnal habits and sluggish behavior when surprised in bright daylight. Under such circumstances, they do not strike directly but fling their heads sidewise, biting thus with lateral strokes. Kraits possess a pair of fangs that, like those of the cobra, are relatively short and rigid and situated on either side of the upper jaw. The poison of these snakes varies in its effect, but one species, *B. cæruleus,* secretes poison even more toxic than that of the Indian cobra. Kraits are oviparous and feed largely on other kinds of snakes. They are much dreaded wherever abundant.

KRAKATOA, a small volcanic island in Sundra Strait, between Java and Sumatra, rendered famous by the most stupendous and destructive eruption of modern times. Dormant for nearly two centuries after recorded activity in 1680, Krakatoa gave warning of inward disturbance in 1877 and again during the spring of 1883. On the night of Aug. 26, in that year, began a series of terrific explosions lasting some 36 hours, during which about half the island was blown away. The detonations were heard at a distance of 3,000 mi. Rock debris was hurled 17 mi. into the air, darkening the sky at midday at places 150 mi. away. Towering sea waves, some of them 50 ft. high, swept adjacent coasts, stranding ships, destroying villages, and taking 36,000 lives. Corresponding atmospheric waves carried volcanic dust around the world, the finer particles hanging in the upper air for months, as evidenced by flaming sunsets in all parts of the globe. Erupted material buried forests and extended island coastlines in the Strait, and showered the decks of ships far at sea for days after the convulsion had ceased. In 1928 the volcano, now submerged, again burst into action, sending a column of steam and water some 650 ft. skyward.

KRAKOW. *See* CRACOW.

KRASINSKI, SIGISMUND, COUNT (1812-59), Polish poet, was born in Paris, Feb. 19, 1812. He was the heir of an old aristocratic family, and proved to possess such precocity that at 14 he had already written two novels, in the style of Sir Walter Scott. At the age of 22 he wrote one of the greatest of his works, *The Undivine Comedy,* a symbolic tragedy illuminated by acute insight into the realities of social class warfare. He taught the philosophy of non-resistance, being a spiritual forerunner of TOLSTOY and GANDHI, and the Polish Government so feared his influence that even to possess his works exposed a man to exile or death. Krasinski was forced to write under fictitious names, and became popularly known as the Anonymous Poet of Poland. His masterpiece is probably *Iridion,* 1836, a dramatic, allegorical and historical poem of exalted patriotism, based on the thesis that Christian love is the mainspring of human progress. His great philosophical poem, *Dawn,* and his principal later work, *Psalms of the Future,* 1845-48, also contribute powerfully to his distinguished position in Polish literature. Krasinski died in Paris, Feb. 23, 1859.

KRASNODAR, formerly Ekaterinodar, the administrative center of the Krasnodar district of the North Caucasian Region of the R.S.F.S.R., and of the Adygeiskaya Autonomous Area. It is situated on the right bank of the Kuban River near the Black Sea. The city is a rapidly growing commercial and industrial community with considerable naphtha resources and local manufactures, as glass, chemicals, tobacco and other products. Situated on a fertile plain, with railroad facilities and a Black Sea outlet, Krasnodar is a distributing center for agricultural products. The city was founded in 1794 as a Cossack settlement. Between 1917 and 1919 there was intermittent warfare in the Krasnodar neighborhood, between Whites and Reds. The Adygey District Historical-Ethnographic Museum and the Kuban District Museum are important institutions. Pop. 1926, 154,303.

KRASNOYARSK, administrative center of Krasnoyarsk District of the Eastern Siberian Region of the R.S.F.S.R., built on the Yenissei River which is joined there by the Kachax River. The progress of the city has been rapid on account of the railway line that has been built. River traffic goes on from

May to December. The region abounds in gold, coal, marble, granite and graphite, and Krasnoyarsk has a gold-refining plant and also factories for making shoes, machinery and other commodities. Pop. 1926, 72,261.

KRASZEWSKI, JOSEPH (1812-87), Polish novelist, poet and critic, was born at Warsaw, July 28, 1812. A writer of the most extraordinary fertility, he was the author of more than 500 works, including historical romances, novels, critiques, travels, political treatises and epic poems. The titles of his novels and romances alone number 240, and furnished the literary food of Poland for several generations. It is from a translation of one of these novels that GEORGE ELIOT is said to have borrowed the theme of her SILAS MARNER. One of Kraszewski's famous works is the epic *Anafielas,* 1840-43, in three parts, based on Lithuanian history. Kraszewski died in Geneva, Switzerland, Mar. 19, 1887.

KRAUSKOPF, JOSEPH (1858-1923), Jewish rabbi and author, was born at Ostrowo in Prussia, and emigrated to the United States at the age of 14. Beginning his American career as a grocer's clerk, he later attended the Hebrew Union College and the University of Cincinnati, and was graduated from both institutions in 1883. Four years later he was called to the rabbinate of the Congregation Keneseth Israel (Reformed) in Philadelphia, remaining in this post until his death. He founded and presided over the National Farm School at Doylestown, Pa. (1897), and helped organize the Jewish Publication Society of America. Dr. Krauskopf died at Philadelphia in 1923.

His published works include: *The Jews and Moors in Spain, Evolution and Judaism, A Rabbi's Impression of the Oberammergau Passion Play, Some Isms of Today,* and 34 volumes of *Sunday Lectures, 1887-*

KREBHIEL, HENRY EDWARD (1854-1923), American music critic, was born at Ann Arbor, Mich., Mar. 10, 1854. He studied law at Cincinnati, later abandoning it for journalism. During 1880-1923 he was music critic of the New York *Times,* championing advanced modern music, although a profound student and admirer of the classics. He did much to further appreciation in the United States of WAGNER, BRAHMS and DVORAK. In 1914 his studies of negro folk-songs were published in *Afro-American Folk Songs.* He died at New York, Mar. 20, 1923.

KREISLER, FRITZ (1875-), Austrian violinist, was born at Vienna, Feb. 2, 1875. At the age of 10 he won first prize at the Vienna Conservatorium. Two years later he won the Premier Prix de Rome at Paris, triumphing over 40 adult competitors. He first toured the United States in 1888-89, returning to Austria to conclude his university studies. He made his adult début at Berlin in 1899. During the World War he served in the Austrian army. He has composed pieces in light vein for the violin, and an operetta, *Apple Blossoms,* successfully produced in the United States in 1919.

KREMENCHUG, a city in central Ukraine S.S.R., situated on the Dnieper River. It is an important center for the lumber trade. Large quantities of logs are floated down the river and the city has sawmills. There are railroad lines and steamship services to KIEV and DNEPROPETROVSK. Kremenchug has progressed continuously since its founding toward the close of the 16th century and to-day is a modern community. There are factories which make agricultural implements and tobacco products. Pop. 1926, 58,832.

KREMLIN, the fortress of Moscow which for many centuries was the nucleus of political and religious life in Russia. It is an area of about 100 acres in triangular shape enclosed by a thick, high wall 1½ mi. long broken by 10 towers, the highest of which top the five gates. The interior contains two palaces, several noteworthy cathedrals, an arsenal and numerous residences built for court officials and the aristocracy. The Great Palace was the chief residence of the Czars until Peter the Great transferred the seat of government to St. Petersburg (now Leningrad) in the early 18th century. The Palace of the Patriarch is noted for its valuable library.

The Cathedral of the Assumption, one of the oldest in the Kremlin, is where the Russian sovereigns were crowned and that of St. Michael has the sarcophagi of the country's rulers. The Cathedral of the Annunciation dates from the 15th century. Since the transfer of the Soviet Government to Moscow, the Kremlin has been the seat of government. The main gateway, formerly the Gate of Salvation, opens onto the Red Square where stands the Lenin mausoleum.

KREUZER, a small copper coin used at one time in Austria and Germany. The Austrian kreuzer was equivalent to about 0.4 cents; the German, 1/16 of a FLORIN.

KREYMBOURG, ALFRED (1883-), American author, was born in New York City, Dec. 10, 1883, and educated there. In 1914 he founded and edited *The Glebe,* and in 1915, *Others,* also a short-lived magazine. He lectured extensively on modern poetry and drama. Kreymbourg's works include, *Love and Life and Other Stories, Apostrophies, Erne Vitek,* novel, *Mushrooms,* a book of free forms, *Others, An Anthology of New Verse, Lima Beans,* a collection of one-act plays, *Lyric America,* an anthology of American poetry from 1630-1930, *Manikin and Minikin,* one-act plays, and *Troubadour,* an autobiography.

KRIEGSPIEL. *See* WAR GAME.

KRISHNA, a god of Hindu India, who is very widely worshiped in that land. He is virtually a combination of two ancient Krishnas, which accounts for his two-sided character. The Krishna of the Vishnu Purana is a musical, amorous, mischievous Cowherd. The Krishna of the Bhagavad-gita is the Only Lord and Savior of his followers who render him their full devotion, or *bhakti.* The composite Krishna is, with Rama as another, a principal *avatara,* or descent, of the god Vishnu, who at times of crisis

in human affairs, has come down from his heaven to benefit his followers. Krishna is more popular, although less admirable than Rama. He offers men salvation (*mukti* or *moksha*) either by devotion to him-



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KRISHNA AND RADHA

From the Rasikapriyā, a Hindu treatise in verse, by Keśava Dās (1520- after 1601)

self, or by mystic eroticism in his name. In his latter rôle the chief center of his worship is Brindaban.

KRISTIANIA. *See* OSLO.

KRISTIANSAND or **CHRISTIANSSAND,** a city of Norway, capital of the district of West-Agder on the Skagerak at the mouth of the Ostra, the terminus of the railroad to the Satersdal, and an airport. It was newly built on regularly laid out streets after the fire of 1892. The city is the seat of a bishop, possesses a cathedral erected in 1880, advanced schools, dockyards, sawmills, a naval base, radio station and two harbors separated by the fortified Oddero Island. The city was founded by Christian IV in 1641. Pop. 1930, 18,781.

KRISTIN LAVRANSDATTER, a novel by the Norwegian Nobel Prize winner, SIGRID UNDSET, published in English in 1929. This novel, chronicling the life from childhood to death of a 14th-century Norwegian girl is a trilogy, consisting of books entitled *The Bridal Wreath,* 1923; *The Mistress of Husaby,* 1925, and *The Cross,* 1927. The first book depicts the childhood and girlhood of Kristin Lavansdatter, emphasizing her love for her father, Lavrans Björgulfsön, and carries her through her marriage to the impulsive young nobleman, Erland Nikulhaussön. The second book deals with the early married life of Kristin and Erland. In the last book of the tragic story, after Erland has been killed by enemies in a political plot, Kristin becomes a nun, and visiting the sick during a plague, is herself stricken and dies.

KRNOV (*Jägerndorf*), a Czechoslovak city on the Prussian frontier, situated at the foot of the Burgberg, surmounting which is a pilgrimage church. In the city are a fine collegiate church, a Minorite abbey with a handsome church, a castle of the Prince of Liechtenstein and a new city hall. Krnov has a textile industry, an organ factory, and large fairs are held there. For several centuries it was the capital of the independent Duchy of Jägerndorf, was plundered by the Tatars in 1241 and suffered greatly from the THIRTY YEARS' WAR. Pop. 1921, 21,129.

KROCHMAL, NACHMAN (1785-1840), philosopher of Jewish history, and a pioneer in the creation of modern Jewish learning, was born at Brody, Galicia, in 1785. In his native land, he found opportunity to study modern languages and literatures as well as rabbinic lore. Besides several Hebrew essays he is the author of a work entitled *The Guide for the Perplexed of the Time,* which, since its first publication in 1851, has gone through many editions, and wielded a profound influence upon the development of modern Jewish learning. Krochmal died at Tarnopol in 1840.

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KROEBER, ALFRED LOUIS (1876-), American anthropologist, was born at Hoboken, N.J., June 11, 1876. He was graduated in 1896 at Columbia University. Appointed instructor in anthropology at the University of California in 1901, he became assistant professor there in 1906, associate professor in 1911, and professor in 1919. He was curator of the Anthropological Museum of the University of California from 1908 until 1925, when he became director. He was a founder of the American Anthropological Association and served as its president during 1917-18. Dr. Kroeber conducted frequent archaeological and ethnological expeditions to South America, Mexico and California, where he made extensive researches into Indian culture, and published many monographs on his observations. His *Anthropology,* published in 1925, is a standard textbook on that subject; other works include *The Arapaho, Zuñi Kin and Clan* and *Handbook of the Indians of California.*

KROGH, AUGUST (1874-), Danish physician, was born at Grenaa, Jutland, Nov. 16, 1874. His work upon the rôle of nitrogen in bodily metabolism was awarded the prize of the Academy of Sciences of Vienna in 1903. With his wife, he made numerous scientific expeditions to Greenland and in 1916 became professor at Copenhagen. In 1920 he was awarded the Nobel Prize for his work on the mechanism of capillary attraction.

KROLEWSKA HUTA. *See* KÖNIGSHÜTTE.

KROLL, LEON (1884-), American painter, was born in New York City, Dec. 6, 1884. He studied at the Art Students' League and the National Academy of Design, New York, and under Laurens in Paris. He is a portrait, genre, landscape and still-life

artist; he was elected to the National Academy. Kroll is represented in the collections of the Pennsylvania Academy of Fine Arts, the Detroit Museum, the Los Angeles Museum, the Chicago Art Institute, the National Academy of Design, the Des Moines Museum and in many private collections.

KRONA, a Swedish monetary unit ordinarily equal to the KRONE of Norway and Denmark and equivalent to 26.8 cents at par. The ORE is $\frac{1}{100}$th of the krona.

KRONSTADT. *See* BRASOV.

KROPOTKIN, PRINCE PETER (1842-1921), Russian anarchist and geographer, was born in Moscow, Dec. 9, 1842. While an officer in a Siberian regiment he explored parts of Manchuria and published a map as a result of these explorations. He became an active member of the Nihilist secret society, was arrested in 1874, escaped in 1876 and edited *La Revolte* in Geneva where he had sought refuge. Banished from Switzerland, and imprisoned in France till 1886, he later lectured and wrote on the defense of anarchism in England and in America. Kropotkin returned to Russia in 1917 but abstained from political activities. He died Feb. 8, 1921.

KRUGER, STEPHANUS JOHANNUS PAULUS (1825-1904), President of the Transvaal Republic, was born in Cape Colony, Oct. 10, 1825. When 10 years old he accompanied his parents on their migration to the land north of the Orange River, at the time of the great trek of the Boers from Cape Colony. There he grew up on the half-civilized borderland, trekking, hunting and fighting, with little education. He was deeply religious, however, and as a member of the strict Dopper sect constantly sought guidance and inspiration in the Bible, especially in the Old Testament.

By the time he was 14 the family had settled north of the Vaal and helped to found the Transvaal State. Having already taken part in several expeditions against natives, at the age of 27 he commanded the one in which the mission-house of David Livingstone was destroyed. By 1856-57 he was aiding M. W. Pretorius in his unsuccessful attempt to form a federation between the Transvaal and the Orange Free States. During the presidency of Pretorius, in 1864, Kruger became commander general of the Transvaal forces. When Burges succeeded to the Presidency, after the overthrow of Pretorius and his party, Kruger carried on such vigorous opposition that it helped to bring about the annexation of the Transvaal by the British in 1877. In the agitation for independence that followed he took a leading part, as he did also in the Boer rebellion of 1880, scoring a signal triumph over the British at Majuba Hill. Together with Joubert and Pretorius he negotiated peace in 1881 and two years later was elected President of the Transvaal. In 1884 the Boers again sent him to England where he negotiated the convention of 1884, by which the Gladstone government agreed to restore the old title of the South African Republic and recognized its right to self-government on condition that all whites be allowed to live there without discrimination and that foreign treaties be made only with approval of the British.

In 1888 Kruger was reelected President and again in 1893, in spite of much opposition to his government's bigoted policy as to state monopolies, and the narrow franchise laws which practically excluded the outlanders, whose numbers had increased greatly since the discovery of gold, from participation in the government. Indignant at the discrimination against them and at the imposition of heavy taxes and military service, the foreigners plotted to overthrow the Kruger régime. In 1895 Dr. Jameson, with the tacit support of Cecil Rhodes, entered the Transvaal. But he was quickly stopped and arrested by the Boers. The raid not only confirmed Kruger in his narrow-minded outlook but increased his popularity so much with the embittered Boers that he was reelected to the Presidency again in 1898 by an overwhelming majority.

The outbreak of the Boer War in 1900 found Kruger too old to fight and he went to Europe in a vain effort to bring about intervention by European powers. After the war he lived at Utrecht where he dictated his memoirs (*Memoirs of Paul Kruger*), published in 1902. He died in Switzerland, July 14, 1904. His remains were taken to Pretoria for burial.

KRUPP, ALFRED (1812-87), German metallurgist, born Aug. 26, 1812, son of a small manufacturer of cast steel. After his father's death, at the age of fourteen, he left school and with his mother carried on the business. Krupp soon found new uses and new markets for the products. He manufactured weldless steel tires and springs for railway vehicles and in 1860 he began the development of artillery which made him famous. At his death the Krupp works employed 21,000 men. Krupp built numerous employee villages with schools, libraries, clubs, parks, etc.

KRUTCH, JOSEPH WOOD (1893-), American author, was born in Knoxville, Tenn., Nov. 25, 1893, and educated at the University of Tennessee and at Columbia. From 1917-20 he was an English instructor at Columbia, in 1920-23 associate professor of English at the Polytechnic Institute of Brooklyn, and from 1925-32 associate in journalism, Columbia University. In 1924 he became dramatic critic and associate editor of *The Nation.* Among Krutch's works are *Comedy and Conscience After the Restoration, The Modern Temper,* 1929, *Five Masters,* 1930.

KRYLOV, IVAN ANDREEVICH (1768-1844), Russian fable writer, was born at Moscow, Feb. 14, 1768, the son of a poor army officer. His satirical *Fables,* 1809, received unparalleled celebrity. Thereafter he wrote nothing but fables and produced nine books of them between 1810-20. Over a million copies were sold during his lifetime. Krylov satirizes smugness and official stupidity and uses the language of the people. His epigrams are extremely popular, and scores have become proverbs in Russia. Krylov died at St. Petersburg, Nov. 9, 1844.

KRYPTON, a chemical element belonging to the group of the RARE GASES, colorless and odorless, symbol Kr, atomic weight 82.9, boils at —152° C., and

freezes at —169° C. It was discovered by Ramsay and Travers in 1898, and occurs in the atmosphere to the extent of one part in a million.

KUBLA KHAN, Grand Khan of the Mongols, Emperor of China (1216-94); also the title of an uncompleted poem by SAMUEL TAYLOR COLERIDGE, published 1798. This melodious fragment describing the stately "pleasure dome" of Kubla Khan, was written by the poet when he awoke from a dream he had had after reading an account of the Great Khan's palace in Purchas's *Pilgrimage.*

KUCHING, a town of northwest Borneo, capital of the independent state of Sarawak, situated on the banks of the Sarawak River about 20 mi. from its mouth. It contains a museum, a palace and several important government buildings. Kuching is the trading center of the district for rattans, coconut palms, rubber, pepper and camphor.

KUDRUN. *See* GUDRON.

KUDU (*Strepsiceros strepsiceros*), or greater kudu, an antelope whose range embraces the entire length of eastern Africa and extends westward to Angola. It is one of the largest antelopes, being about 4 ft. tall and 6 ft. long. The bull alone has horns, which twist in a double spiral to a height of 3 ft. 9 in. The neck



KUDU

and back are crested, and a heavy fringe extends down the throat. The general color is grayish-brown. There is a white chevron on the face, and about eight narrow irregular stripes of white descend down the sides from a white band along the back. The kudu generally goes in pairs or small parties, frequenting bush regions whether of the plains or hills. The lesser kudu of Somaliland and the Kilimanjaro region is smaller and otherwise slightly different.

KUENLUN or **KUNLUN,** the chief mountain range of interior Asia, forming the north frontier of Tibet, as the Himalaya does that of the south. In the west the Kuenlun chain begins as a series of buttresses to the glacier-clad Mustagh; farther east it rises to form a practically impenetrable barrier with a crest line of about 20,000 ft. for a distance of 300 mi. The few streams which break through the outer ranges into the basin to the north do so by deep-cut gorges. The outer slopes of the Kuenlun in the Khotan section of the Tarim basin are barren. Here are areas where steeply serrated ridges and deep gorges have been produced by erosion. Only on rare occasions, however, do these slopes receive heavy rain or snow. When they do, the great aridity of the climate helps to make the erosive force all the more effective. Eastwards the Kuenlun takes a northwesterly trend as far as Lop Nor, where the outermost range of the Kuenlun is known as the Altyn Tagh. The Kuenlun here becomes lower and begins to emerge into the Nan Shah, the southern mountains of the Chinese.

KUHN, WALT (1880-), American painter, was born at New York City, Oct. 27, 1880. He studied art in Paris, Munich and Holland. Like most intelligent painters of his generation, Kuhn was profoundly influenced by the so-called modern movement in art and was one of its earliest exponents in America. After a period of analysis and experimentation, he evolved a personal mode of expression, at once powerful and sensitive. He is chiefly known for his remarkable series of portraits and figure paintings of theater and circus performers. In these works a sympathetic understanding of his subjects as human beings and a highly cultivated taste preserve him from the dangers of sentimentality or the allurements of the obviously picturesque. Among Kuhn's most important works are *Blue Gown,* Whitney Museum of American Art; *Girl With a Mirror,* Phillips Memorial Gallery; and *Jeannette,* Museum of Modern Art. H. M.

KUKENAAM FALLS, waterfalls in the Kukenaam mountains of British Guiana. Towering up from a slope 6,000 ft. above sea level rises an immense sandstone rock about 6 mi. long by 3 wide. From the summit are precipitated several small streams over the rock, forming the highest cascades in the world, so high that the water is blown into ribbons of spray long before it reaches the ground.

KU KLUX KLAN. (1) In the South during the RECONSTRUCTION ERA, a secret association of southern whites designed to promote white supremacy through the political and social subordination of the Negroes. The term embraces, by extension, other societies, such as Knights of the White Camelia, Pale Faces, White League and Invisible Circle, of similar aim and procedure. The Ku Klux began as a young men's social club in Pulaski, Tenn., in 1865, and shortly became a disciplinary organization for frightening Negroes into orderly or servile behavior, making use of a fanciful disguise and mysterious, unintelligible converse which the Negroes called mummicking. With the political ascendency of Negroes and CARPET-BAGGERS, the Klan became violently subversive, perpetrating physical outrages and otherwise overawing or banishing Negroes who voted and white men unsympathetic with the order. In 1868-71 the Klan was at the height of its power; state laws directed against the order were practically nullified by public sentiment.

On Mar. 23, 1871 President Grant in a message to Congress declared life and property insecure in the southern states. Congress took action (*see* FORCE BILL) to give Federal courts in the South extraordinary powers, undoubtedly checking much further violence. But despite the disbanding of the central organization of 1869, local units of the Ku Klux Klan did not dissolve until the primary objects were fulfilled: the State governments put in the hands of southern whites and the Negro vote minimized.

(2) The Knights of the Ku Klux Klan was founded by William Joseph Simmons, experienced promoter of fraternal orders, near Atlanta, Ga., Nov. 25, 1915, and chartered by the State of Georgia Dec. 4, 1915. Its organization and ritual were patterned closely after the old Ku Klux Klan, involving the terms invisible empire, realm, den, grand dragon, grand cyclops, and like fanciful designations, and an ornate, mysterious initiation ceremony; but its philosophy was more properly a recrudescence of the KNOW-NOTHING MOVEMENT. Much use was made of the phrases white supremacy, Nordic supremacy and 100% Americanism. The purposes of the order, varying greatly in emphasis according to the locality, embraced a militant Protestant Christianity; exercise of punishment, especially in cases involving moral offenses, where the courts failed or were lenient; subordination of the Negro; defense against the "Roman Catholic menace," and economic boycott of Jews. The order grew slowly outside the South, and in 1920 was in financial difficulties. Simmons contracted with E. Y. Clarke, an advertising expert, who successfully capitalized the appeal of the order to those whose patriotic activities during the World War had followed a sadistic tangent, and to those whose racial prejudices were easily exploited. By the fall of 1921 the Klan had a membership of about 100,000, and during the next two years received constant publicity in connection with an epidemic of mob violence, particularly virulent in the southern states. Dissensions in the organization transferred control to Hiram Wesley Evans, Texas dentist, but did not check its rapid growth. Between 1920 and 1926 the Klan in several states was a controlling factor in politics, acting through the Democratic party in the South but in Indiana and other northern states making use of the Republican machine. Revolting murders in Mer Rouge, La., popularly attributed to the Klan, other scandals, and a comprehensive exposé of the order by the New York *World* militated against its continued success, and except in Georgia, Alabama and Indiana the Klan was of minor importance by 1928. Exposure of malfeasance by Klansmen in Indiana state offices lost the Klan its control of the Republican party in that state. The defeat of J. Thomas Heflin in the Alabama Senatorial election of 1930 was one of the final blows against a moribund order.

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KULAK, Russian for fist. The kulak, or prosperous peasant, has always been viewed with disfavor by the Russian Communists, who regard him as an incipient capitalist and as the exponent of bourgeois ideology among the peasantry. The rise of a prosperous class of individualist producers has thus been hindered as far as possible with a view to furthering the official theory of collective farming on a mechanized basis. Even before the drive upon the kulaks from 1927 forward, the proportion of kulak farms did not exceed five per cent of the total number, and none of these were large or even medium-sized establishments according to the American scale. This drive was inspired by the fear that the wealthier peasants might secure control of the country's grain reserves and thus jeopardize the national export program and price policy. The recent attitude of the Soviet State toward the kulaks has been characterized by excessive taxation, expropriation, and banishment to Siberia or the Arctic forests in order to eliminate from the agricultural districts the element most hostile to the official projects for collectivization and for the formation of a peasant proletarist. In 1927 kulak families made up about 10 per cent of a rural population estimated at 122,000,000 persons. Of this proportion of kulaks some 75 per cent have been dispossessed and either deported or reduced to the status of the humblest farmers. As a matter of fact, the term kulak has now become an opprobrious epithet applied to any peasant, regardless of his means, who opposes Communist policy. S. H. C.

KULANAPAN, a North American Indian linguistic stock to which belong the group of tribes called POMO, living in California, in Sonoma, Lake and Mendocino counties. Kulanapan, or Pomo, has been combined by several authorities with other linguistic stocks into a single stock called HOKAN.

KULPMONT, a borough in Northumberland Co., eastern Pennsylvania, situated 25 mi. southeast of Sunbury, and is served by the Pennsylvania Railroad. Coal mining is the leading interest of the community. There are silk and shirt factories here. Timber-cutting and farming are the chief industries of the region. Pop. 1920, 4,695; 1930, 6,120.

KULTURKAMPF, the struggle between the Catholic Church and the German Government from 1872-86. Bismarck regarded certain activities of the Church as hostile to the newly formed Imperial Government, and the Church regarded the Government as hostile to Catholicism. Bismarck supported the Old Catholic party and forced through the Falk or May laws forbidding religious orders. Conversations opened between Bismarck and Pope Leo XIII in 1879 resulted in agreement and repeal of the May laws.

KUM or **QUM,** a town of Persia and capital of the province of Kum located between Isfahan and Tehran about 90 mi. from the latter city. Settled by Arabs in the 9th century Kum was prosperous for almost 900 years when it was taken by the Afghans.

Since then it has been on the decline. The town is surrounded by walls now in ruins. Many spacious bazaars become busy when pious Muslims make their annual pilgrimages to the tombs of the saints, for which Kum is noted. Among the Moslem tombs is that of Fatima, sister of the Imam Riza, a descendant of Ali. Shoes, glassware and potteries are manufactured. Est. pop. 1930, 25,000.

KUMASI, or **COOMASSI,** Africa, the capital of ASHANTI, in the British Gold Coast. It is situated on a rock and encircled by marshes. Communication is maintained by rail with Takoradi, Accra and Sekondi, which lies 168 mi. to the south. Modern features of the town include a drainage system, a European clubhouse, bungalows and streets illuminated by electricity. Kumasi is the chief distributing center of Ashanti. Pop. 25,000.

KUMBAKONAM or **COMBACONUM,** a city in the Tanjore district of Madras, British India, on the South Indian railroad. Located in the Cauvery River delta, it was once the capital of the Cholas. It is now a place of Hindu pilgrimage, containing numerous temples and bathing tanks supposedly connected with the River Ganges. The main industrial products are silk, cotton, brassware and sugar. Pop. 1921, 60,700.

KUMISS, a fermented milk (sometimes called kumiss or kumys) originating among the nomads of the Russian steppes, and made from mare's milk.

The essential fermentation is a combination of a lactic and an alcoholic fermentation of the milk sugar in which a number of micro-organisms take part. It is probable that in a normal fermentation the active organisms are the ordinary sour milk streptococci, the lactic bacilli, and a lactose fermenting YEAST. Lactic acid is formed by the two species of bacteria and some of the sugar is converted to alcohol by the yeast.

The composition of kumiss made from mare's milk is given by H. D. Richmond in his book on Dairy Chemistry as follows: water 92.12%, alcohol 2.93%, lactic acid 1.08%, milk sugar 0.50%, casein 0.85%, albumin 0.27%, albumose 0.76%, fat 1.12%, ash 0.35%.

A substitute for kumiss may be made from cow's milk (*see* MILK) by souring the skimmed or the partly skimmed milk with lactic streptococci. One per cent of cane sugar, and a small amount of bread yeast is added. It should be sealed in strong bottles, held in a cool place, and shaken every day for five or six days. L. A. R.

KUMQUAT (*Fortunella margarita*), a fruit-bearing shrub or small tree of the rue family, closely allied to the orange. It is a native of eastern Asia cultivated in the Gulf States, California and other warm regions for its pleasantly acid fruit used chiefly in making preserves. The kumquat grows about 10 ft. high with slightly thorny branches bearing narrow pointed leaves, small white flowers and oblong yellow-orange fruit, about an inch long. The round kumquat (*F. japonica*), a dwarf shrub with broader leaves, bears bright-orange fruit an inch in diameter.

KUN, BELA (1886-), Hungarian president, son of a Jewish notary, was born near Gyor, 1886. In the World War he was captured by the Russians, became a Bolshevist and commanded a corps in the Red Army. Returning to Hungary, when on Mar. 21, 1919 the government was handed over to the Bolshevists by Karolyi, Bela Kun became president. The counter-revolution forced him to flee to Vienna where his extradition demanded by Hungary was denied. After 1920 Kun was active in the Communist International in Russia.

KUNCHIPURAM, a sacred city in the Chingleput district of Madras, British India, better known as CONJEEVERAM.

KUNDT, AUGUST (1839-94), German physicist, was born at Schwerin, Mecklenburg, Nov. 18, 1839. In 1868 he became professor of physics at Zurich, in 1870 at Würzburg, in 1872 at Strassburg and in 1888 at Berlin. He investigated the velocity of sound through gases and evolved the dust figure as a measure. He was able to demonstrate the relationship of the specific heat of gases to pressure and temperature. Kundt likewise made important studies of optical, electrical and heat phenomena in gases, crystals and metals. He died at Israelsdorf, near Lübeck, May 21, 1894.

KUNG, H. H. (1881-), Chinese industrial leader and politician. He is a native of Shansi province and in the direct line of descent from Confucius. He holds a B.A. degree from Oberlin, 1906; M.A. from Yale, 1907, and LL.D. (honorary) from Oberlin, 1926. His wife is the older sister of Madame Sun Yat-Sen. Coming of an old and wealthy family in Shansi, he has been interested in education in the province, and in the development of cotton mills, coal mines and industry generally. Since 1924 he has been active in political affairs. In May 1928 he was made Minister of Industry, Labor and Commerce in the Nationalist Government, and became Minister of Industry when his department was combined with that of mining and agriculture in 1930. He resigned Dec. 1931 with Chiang Kai-Shek.

KUNZITE, a transparent, pink to lilac GEM STONE found in California and Madagascar. It is a clear variety of SPODUMENE, a rock-forming silicate of the PYROXENE group which is ordinarily white and opaque. Spodumene is a lithium aluminium silicate, crystallizing in the MONOCLINIC SYSTEM. Kunzite is found in PEGMATITE veins. It is named for Dr. George F. Kunz, gem expert of New York City.

KUOMINTANG, THE, the Nationalist Party in China which holds a nominal dictatorship over the country. The Kuomintang had its origin in the *Hsing Chung Hui* (Regenerate China Society) organized by SUN YAT-SEN in 1893, as one of a number of secret societies then in existence in China, with the purpose of overthrowing the Manchu dynasty. Following an unsuccessful attempt to seize control at Canton, in 1895, a price was put on Sun's head and he was compelled to flee the country. He spent the next ten years spreading the doctrine of revo-

lution, during that time making two trips around the world in the course of which he secured considerable support and funds from Chinese abroad. Gatherings called by Sun in 1905 at Brussels, Berlin, Paris and Tokyo resulted in the amalgamation of the *Hsing Chung Hui* with several other revolutionary societies into the *Tung Meng Hui* (United Covenant Society) which was the direct predecessor of the Kuomintang. The *Tung Meng Hui* had four planks in its platform: (1) to overthrow the Manchus; (2) to regain the country for the Chinese; (3) to establish a Republic; (4) to equalize land ownership. The revolutionary movement spread rapidly and ammunition was secured from Japan. Ten armed uprisings were engineered before the one at Wuchang on Oct. 10, 1911, which finally was successful. In these, Sun took a prominent part, though at the time of the 1911 outbreak he happened to be out of the country.

After Sun's inauguration as provisional president of the Republic on Jan. 1, 1912, the *Tung Meng Hui* became an open political party, and a number of other organizations joined with it to form the Kuomintang. This party held the largest number of seats in the first national assembly which met on Apr. 8, 1913. This assembly quickly came into conflict with President Yuan Shih-kai, who dissolved the body on Nov. 13, 1913, after a second revolution which was started under Sun's influence in the summer of that year had been put down. The Kuomintang was banned by Yuan. In July, 1914, Sun, insisting that the situation called for revolutionary rather than parliamentary action, gathered the revolutionary elements in the Kuomintang into a new organization which was called the *Ke Ming Tang* (Revolutionary Party) as the direct successor of the *Tung Meng Hui.* The *Ke Ming Tang* led the revolt which blocked Yuan's attempt in 1915-16 to make himself emperor, and in Sept. 1917 set up a military government at Canton in opposition to Peking, with Sun as commander-in-chief. On Oct. 10, 1919, the *Ke Ming Tang* established what it called the Constitutional Government of China, elected Sun as president, and resumed the name of Kuomintang. The student movement starting in the spring of 1919, which developed as a protest against the alleged "selling out" of China to Japan by the authorities at Peking, brought new and vigorous blood into the Kuomintang.

In Jan. 1924, after a succession of ups and downs for Sun at Canton, the first national congress of the Kuomintang was held at Canton. In the preceding year Sun had established working contacts with Soviet Russia—after unsuccessful efforts to get aid from Japan, Great Britain and the United States —and Borodin was in Canton, at the time of the Kuomintang congress, as an adviser to Sun on behalf of Russia. The Kuomintang was reorganized at the congress, somewhat along the lines of the Communist Party in Russia but following also the forms of what in effect was the system of committee control which had been in use in the Chinese guilds, villages and secret societies for centuries. Sun Yat-Sen was elected permanent "party leader." Members of the Chinese Communist Party were, for the first time, admitted to membership in the Kuomintang.

The principles of the party were laid down in a manifesto issued at the end of the 1924 congress. This was a lengthy document, in which the chief emphasis was put on carrying out the "Three Principles of the People" (*San Min Chu I*) which Sun had developed as necessary to the real success of the revolution: (1) The "principle of nationalism," by the application of which China was to be made a united and independent nation, in which the various sub-racial groups (Mongols, Tibetans, Mohammedans, etc.) would be absorbed; (2) the "principle of democracy (or popular sovereignty)," by which the people were to secure not simply general control over the government but direct authority through exercising the rights of election, initiative, referendum and recall; (3) the "principle of the people's livelihood," according to which special attention was to be given to the economic welfare of the people, particularly through equalization of land and regulation of capital. The manifesto also declared (1) that an end should be put to all special foreign privileges in China through the abolition or revision of treaties creating these privileges; (2) that all legitimate foreign loans should be properly secured and repaid; (3) that appropriate division should be made between the authority of the central government over national affairs and that of the provincial and lesser local governments over local affairs; (4) that labor conditions should be improved and labor organizations protected and promoted and, in general, that steps should be taken to establish political equality and improve the condition of farmers and laborers.

The assumption from the time of the 1924 congress has been that the Kuomintang would have charge of the government. A political council, responsible to the central executive committee, was set up in June, 1925, to make preparations for a Kuomintang Government. After the occupation of Peking in June, 1928, by Kuomintang military forces, steps were taken to create a Nationalist Government. An organic law was promulgated at Nanking on Oct. 4, 1928, the Kuomintang assuming the sole right to create and supervise the government. The government, under this law, was inaugurated at Nanking Oct. 10, 1928. The party dictatorship was to last through a "period of tutelage" during which the people were to be trained in self-government, beginning with the *hsien* (county) local units.

Meanwhile, a second national congress of the Kuomintang had been held at Canton in Jan. 1926 and, following the split between the moderates and the Russian-influenced radicals in the spring of 1927, all connections with the Chinese Communist Party had been severed and Communists had been ousted from the Kuomintang.

Organization. The highest authority in the

Kuomintang is the national congress. This chooses the central executive committee which has supreme authority between congresses. The congress also chooses a central supervisory committee which is independent of the central executive committee and exercises general supervision over the conduct of party members. Each of these committees chooses a small standing committee which meets more or less from day to day. The central executive committee also selects from its own membership a central political council which makes political plans but has no authority to issue orders. The central supervisory committee is in effect a revival of the board of censors of imperial days. The party organization for the provinces, special municipalities and counties follows the same general lines as for the country as a whole.

The bureau of statistics of the central executive committee reported a total of 653,779 Kuomintang members on Dec. 1, 1929, and of 266,338, not including those in the army, Oct. 1, 1929. G. C.

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KURDISH, an Iranian language of the INDO-IRANIAN linguistic group of INDO-EUROPEAN, and a cousin of modern PERSIAN, which it generally resembles in grammatical structure, though it is harsher and more complicated. It is spoken over a considerable area in Persia, Iraq, Turkey and some parts of Transcaucasia, and is split into many dialects, the chief divisions being 1. those of the Persian provinces of Kirmanshah and Kurdistan proper (chief town, Senna); 2. the eastern group (between Sulaimaniya, now the chief Kurdish center, and the southern shore of Lake Urmiya); 3. the western group (Diyar-Bakr, Mosul, etc.); and 4. the northern group (Qars, Erzerum, Bitlis, Van and Urmiya). V. M.

KURDISTAN, a large territory in western Asia, composed of Turkish and Persian Turkestan and covering an area of about 60,000 sq. mi. It lies chiefly between 34° and 38° N. lat. and 39° and 48° E. long. The region is mountainous and is watered by the Tigris River and the Greater Zab and Lesser Zab. Turkish Kurdistan includes the vilayets of Bitlis, Diarbekr, Mamuret-ül-Aziz and Van; within Persian Kurdistan are Azerbaijan and Ardelan. The inhabitants, called Kurds and numbering about 2,000,000, are mostly engaged in cattle-raising. The chief cities are Diarbekr, Bitlis and Kermanshah.

KURDS, the people inhabiting Kurdistan, now divided between Turkey, Persia and Iraq. They formed in ancient times an independent kingdom, but were conquered by the Assyrians, the Medes, and the Parthians. Either they were of Aryan stock originally or they have become so with constant fusion with the Aryan peoples of Asia Minor. In the middle period they were conquered by the Arabs, the Mongols, and the Turks, and intermarried freely with their successive conquerors. They were maligned considerably in the late Middle Ages as agents in the brutal methods of the Turks. Although a somewhat savage people, the Kurds are characteristically highly honorable. Since the World War they have rebelled intermittently against Turkish rule.

KURILES, a chain of 31 small islands of Japan, extending northeast of Nemuro Bay and separated from the southern point of Kamtchatka by Kuriles Strait. The principal islands of this group, whose total area is 6,025 sq. mi., are Shumshiri, Paramoshiri, Urup, Onekolan, Simisur, Kunashiri, Etorfu and Shikotan. They are covered with thick vegetation and most of them with nets of seaweed. On some of them, especially on Shikotan, there are forests of bamboo of a remarkable quality. Kunashiri contains a lake whose boiling waters deposit pure sulphur at the shores and at the bottom. Shana, on Etorfu island, is the principal port and settlement. The population of the entire group is about 5,000.

KUROPATKIN, ALEXEI NICHOLAJEVITCH. *See* KOUROPATKIN, ALEXEI NICHOLAJEVITCH.

KURSK, administrative center of Kursk district in the Central Black Soil Region of the R.S.F.S.R., southwestern Russia, situated on the Tuskari River. The Kur river-bed lies between the two orchard-clad hills on which the city stands. Kursk is a railroad center, and has a grain elevator and factories producing machinery, confectionery, tobacco, soap, bricks and ironwork and smelting plants. It was a privately owned principality in the 11th century; demolished by the Tatars, the city was restored in the 16th century. In 1919 clashes between White and Red armies and a prolonged pogrom occurred. A local museum, an 18th century cathedral and a 17th century church and nunnery are the principal buildings. The city was the birthplace of St. Theodosius. Pop. 1926, 64,230.

KUSAN, a North American Indian linguistic stock with tribes once occupying villages on Coose River and Coose Bay and on the Coquille River in Oregon. The Kusan peoples probably lived in early times further inland, but were apparently forced toward the coast by the Yakonan tribes on the north and the Athapascan groups to the south and east. The few remnants of the Kusan tribes are now mainly of mixed blood and have lived on the Siletz Reservation in Oregon. Culturally they were like the neighboring groups, though unlike them they had no clan nor gentile system and did not practice head deformation.

KUSHITIC, a group of languages of the HAMITO-SEMITIC linguistic family spoken by some 6,000,000 persons occupying part of the western coast of the Red Sea and of Abyssinia, and the eastern corner of Africa. Although clearly separated, they share certain grammatical traits and words which make them a coherent group. None of the living members has a written literature, so that they are known—still quite inadequately—only from recent times.

Running from north to south through the areas bordering on the Red Sea and the Indian Ocean are found Beja or To Bedawye (including Bishari, Hadendoa, etc.), the closely related Saho and Afar (the latter the language of the Danakil), and Somali; with Saho-

Afar and Somali is grouped Galla, spoken in the interior of southern Abyssinia. In the high plateaus of northern Abyssinia, the region of Semitic Ethiopic, the Agaw languages survive only in small isolated areas, Bilin, Quara, Khamir, etc.; and in the Abyssinian southwest are the Sidama languages, Kaffa, Walamo, Hadya, Sidamo, etc., where the Kushitic grammatical system has undergone partial change. The extinct Meroïtic, preserved in inscriptions from the region of Meroë, written about the beginning of the Christian Era in an alphabet derived from the Egyptian Demotic, was probably either Kushitic or akin to it. M. C.

KUTCHAKUTCHIN, a not very numerous subgroup of the Kutchin, a North American Indian tribe belonging to the Athapascan linguistic stock. They occupied the banks of the Yukon from Birch Creek to the Porcupine River. They are nomadic hunters and traders, securing most of the necessities of life through trade, making nothing for themselves. Their houses are skin-covered and dome-shaped; their utensils are of wood, horn and birchbark. Socially they are organized into exogamous clans, and practice polygamy and slavery.

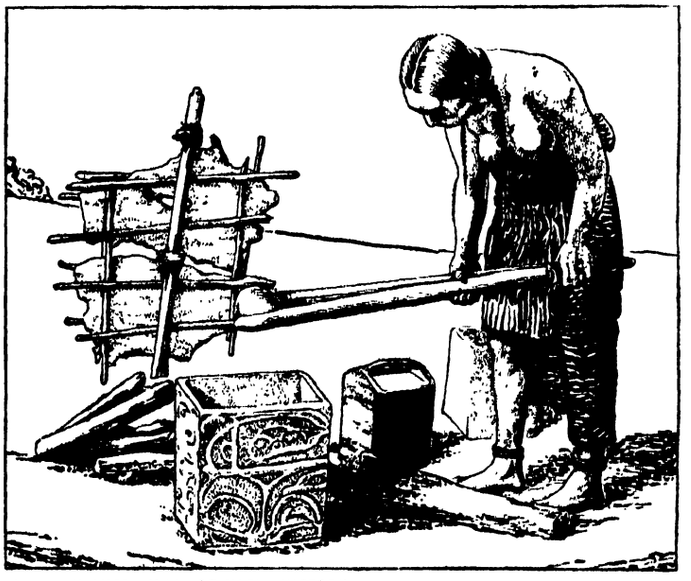
KUTCHUCK-KAINARDJI, a treaty of peace between Russia and Turkey, signed July 12, 1774, after Catherine II's first war with the Turks. Russia received the districts of Kinburn, Yenikale and Kertch in the Crimea, and an embassy at Constantinople with the right to represent the interest of Moldavia and Wallachia, which were restored to their princes. The Tatars of the Crimea were released from their allegiance to Turkey and brought under Russian influence, and the Turkish frontier was pushed back to the River Bug. The treaty remained basic in the relations between Russia and Turkey for many years. It secured a firm footing for Russia on the Black Sea, laid the basis for her subsequent claim to a protectorate over Orthodox Christians in Turkey and guaranteed to her the right of free commercial navigation of Turkish waters.

KUT-EL-AMARA, a town of Iraq, in the vilayet of Baghdad situated on the Shat-al-Hali River at its mouth. This town gained prominence during the World War as the scene where the British forces, under General Townshend, were besieged by the Turks from Dec. 8, 1915, to Apr. 29, 1916. On Sept. 28, 1915, an important battle took place here between the British and the Turks. At one time the town was a grain trading center, and it still contains many large granaries. The inhabitants, numbering about 8,000, are engaged chiefly in weaving rugs and carpets.

KUTENAI, the name of a North American Indian tribe and linguistic stock. Formerly they occupied sections of southeastern British Columbia and northern Montana and Idaho from the Columbia River lakes to Pend d'Oreille Lake, though their traditions place them east of the Rocky Mountains, whence they were driven westward by the Blackfoot or Siksika. Linguistically the stock forms two divisions, Upper and Lower Kutenai. The former comprises the following groups: Akiskemikinik, Akamnik, Akanekunik and Akiyenik. Both divisions were essentially nomadic hunters and fishermen, the Lower Kutenai being excellent canoemen and constructing bark canoes as well as dugouts. Their social organization was simple. Chieftainship was hereditary, marriage was polygamous, no totemic or secret societies were known, slavery was practiced, religion was a species of sun worship and the medicineman exercised great power. In many of the material aspects of life they resembled the Indians of the Plains, hunting the buffalo, using both the skin-covered tipi, as well as the rush-covered lodge, and wearing skin clothing. They have always been on friendly terms with the whites. At present the small number in the United States live scattered about on farms along the Kootenai River in Idaho; those in Canada live in small groups in their ancient habitat; in both countries their old mode of life no longer exists.

KUZNETSK, administrative center of the Kuznetsk District in the Western Siberian Region of the R.S.F.S.R., situated on the right bank of the Tom River at its confluence with the Kondoma and lying in the Kuznetsk coal basin. This area, one of the richest coal fields in the world, covers about 8,500 sq. mi. and is especially noted for its coking coal. Rail transportation is insufficient and in consequence only restricted quantities of coal are sent to Tomsk, and these by the river route. Opposite Kuznetsk on the other side of the river where a gigantic steel mill was under construction in 1932, a new town called Sad-Gorod, meaning Garden City, has arisen with a population in 1929 five times as great as that of Kuznetsk. Kuznetsk was founded in 1618 as a military post and inhabited by Tatars known as Kuznetsi. Pop. 1926, 3,894.

KWAKIUTL, a North American Indian tribe speaking a language of the Wakashan linguistic stock.



COURTESY AMER. MUS. OF NATL. HISTORY

KWAKIUTL WOMAN ROASTING MEAT
From a model by Ned J. Burns

The name usually applies to a group of closely related tribes living in the vicinity of Fort Rupert, Brit. Col.,

as well as to one of the two important linguistic divisions of that stock. Kwakiutl is itself classifiable into three dialects, Haisla, Heiltsuk and Kwakiutl, which are in turn further subdivided. Like the other tribes of the North Pacific Coast culture area, the Kwakiutl place their chief dependence for food upon the products of the sea, are excellent workers in wood, which material is used for houses, implements, and utensils, emphasize rank and wealth in their social organization, maintain a clan system, keep slaves and maintain a series of secret societies which play an important part in the ceremonial cycle.

KWANGCHOW or **KWANG-CHAU-WAN,** a territory attached to French Indo-China, and the region situated on the Lein-chau Peninsula, southern China, opposite the island of Hainan in the China Sea. In 1898 China leased it to France for 99 years. Later two islets in Kwang-chau Bay were added making a total area of 190 sq. mi. The territory is divided into two municipalities, Fort-Bayard, the seat of the local administration and Tchekham, a commercial town. The exports are straw sacks, pigs, cattle, brown sugar and peanuts; the imports are cotton yarns, petroleum, matches and refined sugar. Pop. 1926, 206,000, mostly Chinese.

KWANGTUNG, a province of southeastern China, stretching along the South China Sea and comprising an area of about 100,000 sq. mi. The province is traversed by several important rivers, among them the Chu-kiang, which near its mouth is known as the Canton, and the Pe-kiang. CANTON, one of the great cities of the East, is the capital of Kwangtung province. Immense quantities of rice are grown in the region. Other products are sugar-cane, oranges and bananas. There are extensive mulberry orchards for the support of the silk industry. Firs, timber and bamboos are exported, besides the articles already mentioned. There are many industrial establishments in Canton. Pop. 1925, 36,773,502.

KWANTUNG LEASED TERRITORY, the Japan-controlled leasehold at the end of the LIAOTUNG PENINSULA in Manchuria. Russia in 1898 secured a lease for 25 years on this area. Japan took the leasehold from Russia as a result of the RUSSO-JAPANESE WAR of 1904-5. Japan extended her lease period to 99 by securing agreements from China in 1915. The Leased Territory has an area of 1,400 sq. mi. and contains two excellent harbors, DAIREN and Port Arthur. The Japanese have built up Dairen into an exceptionally well-equipped commercial port and have heavily fortified Port Arthur as a naval base. The Leased Territory is the center of Japanese activities in Manchuria. Pop. 1930, 1,328,011.

KYD, THOMAS (c. 1558-c. 1594), English dramatist, was born at London, probably in November, 1558. His first play, *The Spanish Tragedy,* was produced about 1586, being the first non-religious drama in England. It was extraordinarily popular for a number of years. Its fame was not confined to England, and it was acted in Germany as early as 1601. In 1590 Kyd seems to have abandoned playwriting, for he took a position as secretary to a nobleman. Three years later he was arrested on a charge of heresy and when finally freed his former employer refused to reinstate him in his old position. His last years were passed in poverty and misery. He died, probably in London, about 1594 or 1595.

KYNE, PETER BERNARD (1880-), American popular novelist, was born in San Francisco, Cal., Oct. 12, 1880, and had a public school education. He pursued various occupations, including newspaper reporting, and served in the Spanish-American War, the Philippine Rebellion and the World War. Among Kyne's best known works are *Cappy Ricks,* 1916, *The Valley of the Giants,* 1918, *The Go-Getter, Kindred of the Dust, The Pride of Palomar,* 1921, *Never the Twain Shall Meet,* 1923, *Parson of Panamint,* 1929.

KYOTO, a manufacturing city and former capital of Japan, situated in Kyoto Ken, Honshu Island. The city is surrounded by a range of hills on three sides, and southward stretches into a plain extending to Osaka Bay. As an important center of the fine art industry Kyoto has many wares, including pottery, porcelain, velvets, old embroideries, damascene ware, curios, cloisonné, lacquer, bamboo work, ivory, fans, dolls and toys. It is also a favorite tourist city and has modern shops. Other Japanese towns, as well as foreign trade companies, are supplied by Kyoto.

In 794 the Emperor Kwammu laid out Kyoto in imitation of the Chinese metropolis. When the *de facto* government was established by the Samurai, it was the scene of ruinous fires and fierce battles. Until 1869 Kyoto remained the capital, where the luxurious and cultured lives of the courtiers were led. Still haunted by the aura of Imperial luxury it enjoyed for 11 centuries, Kyoto to-day is considered one of the most beautiful cities of Japan, rich both in historic and religious remains. Among the reminders of her past are the Gosho, palace of the Imperial family until half a century ago; the fine Nijo Castle of the early 17th century; Sanjusangin-Do, Buddhist temple erected in 1251; the Imperial Museum; Chion-In, the most widely known temple of the Todo Sect; Shimogamo Shrine, with its stately festival; and the famous "Cherry Dance" held every spring. Pop. 1930, 765,142.

KYUSTENDIL, a town of southwestern Bulgaria, and seat of the district of the same name. Vines, tobacco and fruits grow in profusion, but Kyustendil is noted locally for its mineral springs. In the 14th century Kyustendil was the capital of Constantin Dragash, a Macedonian king. It remained under Turkish domination till 1878 when it became part of the newly created Bulgarian principality. Geographically, however, Kyustendil is included in Macedonia and the revolutionary organization of that country claims it for the territory of the autonomous state which it is fighting to create. A monument has been erected here to honor the memory of the great Macedonian patriot-revolutionist, Todor Alexandroff, who was assassinated in Mt. Pirin in 1924. Pop. 1931, 15,702.

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LABICHE, EUGÈNE-MARIN (1815-88), French dramatist, was born at Paris, May 5, 1815. After writing one novel, Labiche devoted himself to comedy. He had verve and Gallic humor, verging occasionally on buffoonery. His most famous play, *Le Chapeau de paille d'Italie,* was produced in 1851. *Le Voyage de Monsieur Perrichon,* 1860, was also popular. He was elected to the French Academy in 1880. Labiche died at Paris, Jan. 23, 1888.

LABLAB (*Dolichos Lablab*), a tall, twining, exceedingly variable annual of the pea family, called also hyacinth bean and bonavist. It is a native probably of the Old World tropics, widely cultivated as a food plant and in various forms as an ornamental. The twining stems, usually 5 to 10 ft. but sometimes 30 ft. long, bear leaves of broad ovate leaflets and purple or white flowers in clusters. The flat, papery pods and the blackish seeds are eaten.

LABOR, an economic term often used in conjunction with CAPITAL as in the phrase labor and capital, and also intimately linked up with the subject of WAGES. Labor and capital are two of the most important factors in industrial production; and just as capital obtains its return in the form of PROFITS, so the compensation of labor takes the form of wages. Moreover, the value of a commodity is at least partly determined by the quantity of labor-time involved in its production. Economists of the Marxian (*see* K. MARX) school even go so far as to assume that capital itself when it takes the form of machinery or other instruments of production is nothing but the congealed embodiment of labor-time in a more or less permanent form. The labor process therefore concerns itself with the creation of values either for immediate consumption as measured by wages and profits or for ultimate consumption in the form of salable commodities or instruments of further production. The INDUSTRIAL REVOLUTION of the 19th century carried in its wake a marked increase in the efficiency of labor due to the introduction of mechanical processes and a corresponding division of labor. This division of labor accentuated in its turn the tendency towards the cheapening of commodities and towards the accumulation of capital.

As industrial establishments grew in size the consequent massing of workers tended to facilitate labor organization and to intensify the recurrent clashes between labor and capital. The continued growth of the labor unions both in size and importance created a situation in which industrial conflict seemed to be a normal adjunct of the industrial process. Strikes and boycotts were the weapons of an interminable dispute as to the minutiae of wages and the hours of labor. The first decades of the 20th century witnessed the revival of many attempts to remedy this disastrous state of affairs. Boards of arbitration and conciliation were established and many schemes were proposed to increase the share of labor in the industrial process. Especially promising were various plans of profit-sharing and the application of democratic principles to industrial management. Legislation, too, took a share in assuaging the bitterness of the conflict between capital and labor. This legislation took the form of child-labor laws, laws regulating the hours of labor and wages of women, compensation laws, old-age pensions, unemployment insurance, and the entire mass of similar laws included under the comprehensive term social legislation. *See also* PRIMITIVE LABOR.

LABOR, DEPARTMENT OF, under the Secretary of Labor, a government department established to advance the interests of wage-earners in the United States by improving their working conditions and their opportunities for profitable employment. The Secretary is empowered to assist in the mediation of labor disputes, to require the cooperation of other departments in collecting and collating statistics on labor conditions and commodity distribution, and to supervise the enforcement of immigration and Chinese-exclusion laws. Besides two assistant-secretaries, the Department head has a chief clerk, disbursing clerk, appointment clerk and a number of subordinate employees. A branch of the Department of Labor is the United States Conciliation Service, which is charged with the duty of seeking peaceful settlement in any industrial trade dispute. The bureaus of the Department of Labor include a Bureau of Labor Statistics, charged also with investigating the causes of controversies between employers and employees; a Bureau of Immigration; Bureau of Naturalization to supervise the work of the courts in naturalization matters; a Children's Bureau for all matters pertaining to the welfare of children—health, employment, delinquency and the like; a Women's Bureau for women in industry; and the United States Employment Service.

S. C. W.

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LABOR, HOURS OF. A century ago, most laborers worked more than 12 hours per day. Enormous increase of productive efficiency has made excessive hours unnecessary, and with the strain and danger of modern working conditions has come the necessity for their restriction, not only from the point of view of health and welfare, but also from that of efficient use of man-power resources.

In the United States restrictions upon working hours of women and children are general. Most states have such regulatory laws. For women the 8- and 10-hour day or a maximum number of hours per

week, varying from 48 to 60 is generally provided. A few progressive states have 8-hour laws. Often, however, only certain classes of industries are restricted. Women employed in agriculture and domestic service are generally excluded. The majority of states have 8-hour laws for working children. About one-quarter permit 9 hours. The remainder allow 10 hours or more, 11 and 12 hours even on night work being sometimes permitted.

Laws regulating hours of adult male labor have been successful only in public and quasi-public employments and in hazardous work where long hours are dangerous to the individual and a menace to public safety. The Federal Government has provided an 8-hour day for its employees doing manual work, for employees on railroads and for those on contracts for Federal Government work. More than half of the states and many municipalities provide for an 8-hour day for their employees.

In private employment regulation has been declared constitutional only where the public interest is jeopardized by the absence of regulation. For the majority of male adult workers, therefore, hours have been decreased mainly through trade union (*see* LABOR ORGANIZATIONS) efforts. Shorter hours have been one of the main objectives of the AMERICAN FEDERATION OF LABOR and hours vary with the industry and the locality, according to the strength of organized labor.

In 1840 the average length of the working day was 11.4 hours, in 1920, it was 9 hours. The 8-hour day now prevails generally in the skilled trades. For the working week, the goal of achievement has successively advanced from 84 to 72 to 60 and gradually to 48, 44 and even 40 hours. The 6-hour day has recently been considered as a means of relieving unemployment. In 1930 approximately 533,000 skilled workers, members of 48 unions, including many building, clothing and printing trades were enjoying the 5-day week as were large numbers of skilled workers in automobile manufacturing plants.

Enjoyment of shorter hours is limited for the most part, however, to skilled workers. Unskilled and unorganized workers have neither the protection of legislation nor of the trade union. For such workers, and for those employed in industries which, by reason of their technical nature or of public necessity, require continuous operation, the 10-hour day, or longer, and sometimes the 7-day week prevail.

Excessive hours result in premature old age, fatigue (*see* FATIGUE IN INDUSTRY) and increased susceptibility to disease, limitation of leisure, of education and of recreation, abnormal home life, unrest and discontent. Researches into labor conditions point to their social and economic undesirability. P. F. B.

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LABOR AND POLITICS IN AMERICA. During most of its history the American Labor movement has placed chief emphasis upon economics rather than politics. It has sought its major objectives of higher wages and better working conditions through the trade union method of collective bargaining. At the same time, however, labor has been so vitally concerned with governmental affairs that it could not escape, even if it had so desired, an active part in politics. In the first place, there are certain labor objectives, such as restrictions upon the injunction, which are attainable only through legislation; and in the second place, it is highly important to labor that the political administration be at least not unfriendly to its interests. An unfavorable administration, as has been repeatedly demonstrated, may so construe existing laws, the antitrust laws for example, as seriously to threaten the existence of organized labor.

Labor, therefore, could not avoid politics. The only real question has been as to whether this activity should express itself in an attempt to form its own political party, or should seek its ends through existing parties. At certain periods the idea of independent action has been in the ascendency. Thus as early as 1828 a well-developed labor party was under way, with many candidates for state and local offices and a number of victories. This political outburst lasted only about five years but it had a profound effect upon early social legislation. Again, following the panic of 1873, with its disastrous effects upon organized labor, many leaders turned to political action as the only way out of labor's difficulties. Efforts were made to combine the interests of the farmers and labor in a national party, and in the 1878 Congressional elections the farmer and labor candidates polled a very large vote. This movement, however, did not outlive the return of prosperity a year or two later.

In 1886 the American Federation of Labor was organized and shortly became the dominant factor in the American labor movement. Since the beginning the federation has adhered fairly consistently to a policy of opposition to independent political action. In the period of acute unrest following the World War, labor broke with many traditions. Thus in 1919, the United Mine Workers declared in favor of government ownership of coal mines, and in 1920 the federation, supporting the railroad organizations, declared for democratic control of the railways according to the Plumb plan. In 1924, practically the whole labor movement lined up behind the new progressive party led by Senators LaFollette and Wheeler, and the executive council of the federation gave these candidates its formal endorsement, stating, however, that in endorsing the candidates it was not giving approval to a third party movement. W. J. LA.

LABORATORIES. In the middle ages, a laboratory was a chemist's work room; to-day, the word is sometimes applied to a chemical or biological manufacturing plant; usually, however, it means a place devoted to instruction, testing or research in the exact sciences. Laboratories of various kinds are an essential part of the equipment of practically every school beyond the secondary class. The laboratory facilities of some colleges and universities are very complete and, in many special fields, unexcelled. These labora-

tories are used chiefly for instruction, but increasing emphasis is being placed on them as a place for carrying on original research and as a means for training advanced students. National laboratories, similar to the BUREAU OF STANDARDS in Washington, are maintained at government expense in the leading industrial countries to carry out investigations of general interest in pure and applied science. A third type of laboratory is that maintained by industry to develop and improve its own processes or to discover new processes. The number and importance of industrial laboratories has grown rapidly and in 1928 the National Research Council stated that industry in this country was spending each year for research an amount equal to 1.3% of the capital invested.

F. G. H.

LABORATORY WORKER, one who conducts tests or experiments in a laboratory, a hospital or a research bureau, but always under expert direction. He need not have a scholarly mastery of the science or sciences with which he is working; but he must have familiarity with them, possess an orderly mind and the ability to carry out instructions faithfully. He must be accurate and have good perception. Though his work is usually of a routine nature, allowing only limited opportunity for either initiative or originality, it is often a valuable and necessary first step in a scientific career.

LABORERS, STATUTES OF, in England, a series of enactments, arising in 1349 out of the shortage of labor, which followed the ravages of the BLACK DEATH. Every man or woman under 60 years of age, not having property or land to cultivate, was compelled to accept work at wages current two years before the plague. By a further statute, 1351, the laborer was forbidden to leave his village in search of work at higher wages and was so tied again to the soil. Fines inflicted on fugitives added considerably to the royal revenues. Runaway laborers were branded on the forehead with a hot iron, and to harbor such a laborer was a severe offense. The anger aroused by this legislation was one of the contributing causes of WAT TYLER'S REBELLION. (*See also* HUNDRED YEARS' WAR.)

LABOR EXCHANGE. *See* EMPLOYMENT EXCHANGE.

LABOR LAW. Both employers and employees have the right to organize into voluntary groups or associations and, through the exertion of their combined economic and social pressure, to secure and advance their respective economic interests. The method of legally securing the rights of members within their own organizations, as well as the legal status of such organizations—their right to sue or be sued, their legal liabilities and the effectiveness of their contractual relationships—are problems not peculiar to labor organizations, but involved in the general law of voluntary associations. It is to be said of labor unions, however, that the Supreme Court has held that even in the absence of enabling statutes a union is distinct from its membership, suable in the common name and liable to damages from the common fund (United Mine Workers v. Coronado Coal Co., 259 U.S. 344,

The right to combine has limits which are usually expressed in the formula that the end sought to be achieved must be legally justifiable. Violence, physical coercion and intimidation are universally forbidden, regardless of purpose. The strike (a concerted cessation of work) is generally permitted when its objectives are shorter hours or improved working conditions; but objectives of slightly less direct benefit, e.g., unionization or enforcement of a collective bargaining agreement are in some states held not to justify the strike. The privilege of peaceful picketing, of publication of an "unfair list," maintaining a boycott (exertion of economic pressure upon a third party not directly interested in the dispute) are delimited by similar considerations with different results in different states. Lately, judicial difference has centered on legality of inducing workers to join a union despite previous agreement with their employer not to do so ("yellow-dog" contracts). New York has held that the inducement is justifiable; but other courts have held otherwise. *See also* LABOR LEGISLATION.

N. G.

LABOR LEGISLATION. The earliest state labor laws in the United States were enacted in the first half of the 19th century, and were known as factory acts because they regulated the employment of women and children especially as regards hours of work in factories. The past 25 years, however, have brought a rapid growth of state and Federal legislation to protect and promote the safety, health and economic condition of all wage-earners. Thus state labor legislation now also includes laws relating to industrial safety and sanitation, vocational rehabilitation of disabled workers, hours of work for men in certain hazardous occupations, wage payment, minimum wages for women and children, settlement of industrial disputes, regulation of fee-charging employment agencies, establishment of public employment offices and the investigation of working and living conditions of wage-earners. Another group of state labor laws which have been enacted in the United States since 1911 may be classed as SOCIAL INSURANCE. These include workmen's accident compensation (*see* WORKMEN'S COMPENSATION), mothers' pensions, and old age pensions (*see* PENSIONS, OLD-AGE). In European countries UNEMPLOYMENT INSURANCE and HEALTH INSURANCE is also provided by law. Federal labor legislation in the United States includes workmen's accident compensation for the District of Columbia, for longshoremen and Federal employees; vocational rehabilitation; settlement of industrial disputes; and investigation of labor problems.

In addition to statutes enacted by the state and Federal legislatures, there are many codes of detailed regulations which have been issued by state and Federal administrative departments and which have the full force and effect of labor laws. These administrative regulations, mostly relating to industrial safety

and sanitation, are usually based on general powers granted to the labor departments by the legislatures which have recognized the impracticability of writing such detailed provisions into the statutes on account of the rapidly changing complexities of modern industrial conditions.

Special governmental departments have been created to administer the labor laws. Most states have bureaus employing inspectors who visit places of employment to enforce the laws relating to safety and sanitation and the employment of women and children. Workmen's compensation laws are commonly administered by commissions or boards which decide disputed claims for compensation. Bureaus of labor statistics have also been established to investigate wage rates, employment, and other facts relating to working conditions. Although the majority of states have more than one department administering labor laws, there has been a tendency to centralize the enforcement of such laws in a single state department of labor.

That the state and nation has a vital interest in the well-being of its wage-earning men, women, and children has seldom been questioned. Labor legislation is a recognition of the inability of many wage-earners, from lack of knowledge or of bargaining power, to protect themselves from conditions which some employers might otherwise impose upon them. Such legislation also seeks to protect children from early and injurious employment. (*See* CHILD LABOR.) State labor laws are therefore an expression of the police powers of the states. Federal regulatory labor laws are based mainly upon the power of Congress to regulate interstate commerce.

In general there is now no question as to the constitutional power of the states to regulate industrial safety and sanitation or the hours and condition of employment of women and children. Attempts to regulate wage rates and to limit the hours of employment of men have, on the other hand, in several instances been overruled by the Supreme Court of the United States on the ground that they have violated the freedom of contract and property rights guaranteed by the 14th amendment to the Constitution. The advancing industrialization of the United States, however, has been and probably will continue to be accompanied by the development of an increasingly liberal court doctrine in this field. J. B. A.

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LABOR ORGANIZATIONS, associations of employees organized primarily to improve their economic status. Structurally, there are three main types: Trade, Industrial and Labor Unions. Trade or craft unions are organizations of employees engaged in a single or in related occupations. The industrial union is an association of all workers within a given industry, regardless of craft. Labor unions bring together in one association all workers in a locality, regardless of craft or industry. The Locomotive Engineers illustrate the first type, and the United Mine Workers the second. The so-called Federal locals of the American Federation of Labor are examples of the third type.

Skilled groups began to organize about 1785, but it was not until after the 1st quarter of the 19th century that labor organizations became a significant factor in industrial life in the United States. By the end of the 60's there were at least 32 national trade unions. Increasing with industrial prosperity and receding somewhat with industrial depressions, labor organizations have gradually grown in strength and significance, until in 1931 they had a membership of approximately four million workers, skilled workers for the most part. Only about 20% of the total number of organizable workers are members of the movement. Those industries in which most complete organization exists include building and electrical trades, printing, clothing and coal mining. The largely unorganized industries include iron and steel, textiles, oil refining, paper, lumber, metalliferous mining, metal trades and farming. Certain industries, as food and shipping, are partially organized.

Union structure varies widely between organizations. The simplest consists of a national or international central body with its subordinate locals. In more complex organizations there are district and state councils and systems of boards and committees, often territorial in their jurisdiction. Local unions, large or small, are the units which make up the national body. They have their own democratic government, with the usual officers and committees. They conduct local business, but the general policies are usually determined by the national body which exercises broader powers and is the dominant factor in the organization. The functions of the national body as fixed in the constitution include chartering locals, establishing rules for local conditions of work, authorizing STRIKES, controlling general finances and insurance funds, propaganda and publicity. The law making body of the national is the convention, a delegate body representing the locals, meeting at fixed intervals or on call. Most national unions function between conventions through an executive board, usually made up of officers of the union.

The aims and functions of labor unions, originally limited to bettering the lot of workers through WAGES, hours, and physical conditions of work have broadened and trade unions are now demanding economic, political, and social changes. They have launched cooperative ventures such as labor banks and credit unions. They are cooperating with employers in the improvement of operating efficiency and quality of product. Their philosophy is still practical and opportunistic, a philosophy which has enabled them to survive.

International Labor Organizations. The international labor movement is composed of about 70 organizations representing five different creeds or points of view; namely, socialist, communist, syndicalist, Christian and nonpartisan. Each of the five has its system of supplementary organizations whose activities are respectively industrial, trade, political and cultural.

The largest group is the International Federation of Trades Unions, the so-called Amsterdam International with a membership of over 13,000,000 workers in 28 countries, mainly European. Socialist principles govern its activities, which include educational, political, organizational and legislative work. It comprehends 27 international trade secretariats, organized on a craft or industrial basis, entirely independent in their internal affairs but obligated in matters affecting other trades to carry out the policies of Amsterdam. Politically it cooperates with the political socialist international organization—the Labor and Socialist International and its auxiliaries. It is affiliated with the International Labor Office of the LEAGUE OF NATIONS. It concerns itself with the promotion of mutual insurance and collective bargaining, with the improvement of international standards of wages, hours and conditions of labor and with the elimination of competition between workers of different countries.

The next largest group is the communist, Red International of Labor Unions, organized with the purpose of capturing the non-communist labor organizations. It has a varied membership in many countries, in some of which it has highly centralized national branches, in others, local or general industrial unions or associations of partisan and minority groups. Its objectives are essentially the same as those of the Third, or Moscow, International, the communist political organizations, with which it closely cooperates. It relies upon the class struggle and dictatorship of the proletariat, both of which are political concepts. The trade unions, therefore, are instruments peculiarly fitted to its purposes.

The syndicalist international labor movement, practically shattered by the World War, still has a nominal existence in the International Working Men's Association. Seven American countries have syndicalist trade unions, mainly in the building and metal trades. Their program is the revolutionary reorganization of society through the trade unions, which the syndicalists consider the proper structural basis for the future society. They believe that the workers must destroy not only capitalism but the political state itself. The syndicalist international has contacts with various national anarchist groups.

In 15 European and three American countries there are so-called Christian trade unions affiliated with an International Federation of Christian Trade Unions and composed of both Catholic and Protestant workers with a membership in 1928 of about 1,500,000, mainly in Germany, Belgium and Holland. Their organization is similar to that of the free trade unions, but their emphasis is upon religious sanctions. The Catholics predominate and the principles of the organization derive their inspiration from the encyclicals of the Popes.

Although some of the international unions affiliated with the American Federation of Labor are affiliated also with trade secretariats of the International Federation of Trade Unions, the American Federation of Labor, as a national body, is not affiliated with any of the political or partisan internationals. Largely at its instigation, however, the nonpartisan or neutral Pan-American Federation of Labor was organized as an international association of independent trade unions emphasizing nonpolitical trade unionism, collective bargaining and educational activity. Repeated efforts to interest European organizations in this type of international have failed and the Mexican Confederacion Regional Obrera Mexicana and the American Federation of Labor are its principal adherents.

P. F. B.

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LABOR PARTY IN GREAT BRITAIN, the political party of the British Socialists and Trade Unions. It formed the governments of 1923 and 1929. Both times, being without a Parliamentary majority, the labor governments depended for their existence on support from the Liberal Party. The Parliament elected in 1923 actually had fewer Labor members than Conservatives.

The Labor Party grew out of the Labor Representation Committee, which body was formed largely as a result of the efforts of the Independent Labor Party, a non-Marxian socialist party. Their propaganda and repeated resolutions every year at the Trade Union Congress bore fruit in 1899, when the Congress was at last persuaded to set up the Labor Representation Committee. This committee was independent of the Trade Union Congress and was based on a plan, similar to the present constitution of the Labor Party, written by George Bernard Shaw, Keir Hardie and James Ramsay MacDonald. The Labor Representation Committee was not definitely a separate party. Its purpose was to create an independent group of Labor members in Parliament, with their own whip. At the same time they cooperated with other party groups, particularly the radical wing of the Liberal Party, in furthering labor and social legislation.

The general election of 1900 came only a few months after the formation of the Labor Representation Committee. At this time there was no political levy on the trade unions for its support. But with the help of contributions it was able to contest 15 constituencies, and succeeded in winning two seats in Parliament—Merthyr (Keir Hardie) and Derby (Richard Bell).

The Labor Representation Committee grew rapidly, winning a few seats in Parliament at bye-elections and gaining the support of more and more trade unions. In 1906 it became a full-fledged political party, adopting the name of Labor Party. With only two exceptions (1924 and 1931), each Parliament since 1900 has contained an increase in Labor representation—1900—2; 1906—29; 1910—40; 1910—42; 1918—57; 1922—142; 1923—191; 1924—151; 1929—287; 1930—52 (not including the 12 Labor supporters of the "National Government").

The Labor Party is unique among British political parties in its constitution. It is not merely a federation of local branches, each formed of individual members, but is a federation of national trade unions, socialist societies, cooperative societies and local party branches, each of these bodies paying affiliation fees to national headquarters. The local Labor Party branch is similarly constituted. Affiliated and paying fees to it are the local branches of the trade unions, cooperative societies, socialist societies and individual members.

BIBLIOGRAPHY.—G. D. H. Cole, *A Short History of the British Working Class Movement;* Labour Party annual reports and other party publications.

LABOR SCHOOLS, institutions for WORKERS' EDUCATION, usually controlled by working class organizations, aiming to educate workers particularly in matters directly affecting workers as a class.

Dr. Marius Hansome groups such institutions in five categories. Consumers' cooperative are exemplified by the Cooperative College in Manchester, England, the Cooperative Institute in Leningrad, and the Cooperative School in Hamburg. These institutions give vocational education to the personnel of cooperative enterprises and propagate knowledge of Rochdale principles. *See* ROCHDALE PIONEERS.

An example of education with trade union emphasis, educating trade unionists for leadership, is the Workers' Education Bureau. This is the educational clearing house of the American Federation of Labor, with study groups throughout the country. In 1929, it severed connections with Brookwood Labor College, Katonah, N.Y., due to the leftward tendency of the latter. Most famous of trade union schools is RUSKIN COLLEGE, Oxford, founded by three Americans in 1899, now controlled by British working class organizations. Institutions with political emphasis include such socialist schools as the Rand School, New York City, Die Heimvolkshochschule of Tinz, Germany, and the London Labor College. With a Communist viewpoint is the Workers' School, in New York City.

Among general cultural organizations the largest is the Workers' Educational Association, with classes all over Great Britain. Finally there are institutions integrating, in their teaching, the various phases of labor movements—trade unionism, cooperation and politics. Most notable is the Centrale Éducation Ouvrière of Belgium, with its local, regional and national schools.

BIBLIOGRAPHY.—Marius Hansome, *World Workers' Educational Movements.*

LABOR TURNOVER, a measure of mobility of labor as reflected in the frequency and range of movement of workers from plant to plant or region to region. In individual enterprises it takes the form of labor changes, i.e., accessions to, and separations from, their service. Labor turnover refers to such of these labor changes as are associated with the maintenance of the work-force. It is the shift and replacement of labor incident to such maintenance. The extent of the turnover, in any given plant, can be determined by ascertaining how many replacements were required during, say, one year to keep each job, or each 100 jobs, filled. In practice most employers consider only the relation between the number of separations and the average size of the work-force during the same period. They usually calculate this as percentages of turnover by dividing the average number in the work-force by the number of separations and multiplying by 100. The average number on the pay-roll is taken to reflect the size of the work-force. A better method is that followed by the Federal Bureau of Labor Statistics, which derives rates of accession and separation by dividing their number by average payroll and publishes as the net turnover rate the accession or separation rate, whichever is lower. This process eliminates non-turnover changes due to plant expansion or curtailment.

Turnover is consistently higher in periods of prosperity than in depression. In the United States during the World War the turnover of manufacturing labor, to which systematic statistics are, so far, confined, was between 100 and 150%. In the decade 1920-30, it was reduced to about 50%. The study and measurement of labor turnover has been almost entirely confined to the United States, but some foreign countries, especially Germany and Russia are now giving attention to it. P. F. B.

BIBLIOGRAPHY.—S. H. Slichter, *The Turnover of Factory Labor,* 1919; P. F. Brissenden and E. O. Frankel, *Labor Turnover in Industry,* 1920.

LABOR UNION BENEFITS, allowances paid or services rendered by trade unions for the relief of members in need. The international unions pay benefits for death, strikes and lockouts, sickness, disability, unemployment and old age. Most unions pay some sort of benefit. Strike, death, disability and sick benefits are most common. Eligibility for benefit requires fulfillment of specified requirements as to age, union membership, physical and financial condition. Participation is often optional. Funds are secured by dues or assessments. The amount of benefit paid depends upon length of membership and varies widely between unions. Death benefits range from $20 to $1,500, with $50 the most common minimum and $200 or $300 the usual maximum. Disability benefits, usually paid in a lump sum, vary from $50 to $500. Sick benefits range from $4 to $10 weekly for from 7 to 16 weeks. Five dollars for 13 weeks is most common. These amounts are sometimes supplemented by local unions. The unemployment benefit is a small percentage of wages regularly earned and is insufficient for subsistence without further aid. Few funds are on an actuarial basis and, without burdensome special assessments, are seriously limited. Although individual amounts are very small, the total is impressive. In 1929, the American Federation of Labor reported that approximately $32,250,000 was paid in benefits by national and international unions.

Additional services which trade unions render their members include homes for aged, disabled or tubercu-

lous members, dental, optical and general medical care, especially for diseases peculiar to the trade, relief allowances for cases not specifically covered and provision for families of deceased members, housing and recreational facilities, business enterprises, e.g., banks, and insurance departments in which members may buy insurance covering death, sickness and accidents at reasonable rates. P. F. B.

BIBLIOGRAPHY.—U. S. Bureau of Labor Statistics, Bulletin 465, *Beneficial Activities of American Trade Unions*, 1928; Matthew Woll, *Trade Union Benefits*.

LABOUCHERE, HENRY DU PRÉ (1831-1912), British statesman, was born in London on Nov. 9, 1831. After studying at Eton and Cambridge he entered the diplomatic service in 1854, ten years later becoming interested in politics. In 1880 he was elected radical member of Parliament for Northampton. The weekly journal *Truth* which he founded, was designed to expose frauds and impostures. Labouchere died in Italy on Jan. 15, 1912.

LABRADOR, a dependency of Newfoundland and a large peninsula forming the northeast corner of North America. Formerly the portion belonging to Labrador was only a narrow strip of land along the Atlantic coast, extending from Blanc Sablon to Cape Chidley. The boundary between Labrador and the province of Quebec was long in dispute between Newfoundland and Canada, but in March 1927 the English Privy Council defined the boundary as a line drawn due north from the eastern boundary of Blanc Sablon as far as 52° N. lat., then west along that parallel to the Romaine River, and north to its source. The line continues west and north along the crest of the watershed of the rivers flowing into the Atlantic until it reaches Cape Chidley. This territory has an area estimated at 110,000 sq. mi. The climate is exceedingly rigorous, winter lasting about nine months.

The natural resources of Labrador are important, about 20% of the area is forested and capable of producing black spruce of commercial value. Mineral wealth has not been seriously estimated, though some prospecting has been done.

Many fur-bearing animals are found, and important fisheries produce cod, salmon and herring. Several rivers occur, and the waterpower resources, even in their regulated condition, are capable of developing a very large amount of power.

There are no towns, but several mission stations, notably those of the Grenfell International Association, are scattered along the coast. Est. pop. 1931, 4,203. The inhabitants are mostly Eskimos engaged in fishing and hunting.

LABRADOR CURRENT, a cold current of water originating in the Arctic Sea and flowing southward through Baffin Bay and Davis Strait along the western shores of Greenland and Labrador into the north Atlantic near the Grand Banks. It constitutes the chief vehicle for the supply of icebergs, as well as of enormous masses of floating ice carried down from the glaciers of Greenland. Upon meeting the warm waters of the Gulfstream and its accompanying moisture-laden air, in the region of the Grand Banks, the chill of the Labrador current produces dense fogs. Continuing its course southward, it becomes wedged in as a cold wall between the Gulfstream and the eastern seaboard of North America, to which it thus imparts a severe climate. Still further south the colder and heavier waters sink down to greater depth and flow into tropical seas.

LABRADORITE, a FELDSPAR showing a beautiful play of colors in blue, green, yellow, red and gray, caused by microscopic inclusions. When in large masses it forms a rock, called labradorite or anorthosite, frequently used as an ornamental stone. Labradorite is a calcium sodium aluminium silicate, between albite and anorthite in composition, crystallizing in the TRICLINIC SYSTEM. It takes its name from Labrador, where it is found abundantly. *See also* GABBRO; PLAGIOCLASE; MINERALOGY.

LABRADOR TEA, the common name for a genus (*Ledum*) of fragrant evergreen shrubs of the heath family found chiefly in bogs and marshy places. There are 6 species native to north temperate and arctic regions. They are mostly low shrubs with narrow or oblong thick leaves and white flowers in showy terminal clusters. The North American species include the common Labrador tea (*L. groenlandicum*), found from Massachusetts to British Columbia and northward to Labrador and Greenland; the western Labrador tea (*L. glandulosum*), poisonous to sheep, ranging from the Rocky Mountains westward to the Pacific Coast, and the narrow-leaved Labrador tea (*L. palustre*) of wide, far northern range. The astringent leaves have sometimes been used as a substitute for tea.



P. A. RYDBERG, "FLORA OF PRAIRIES AND PLAINS"

LABRADOR TEA

LABROUSTE, HENRI (1801-75), French architect, was born at Paris, May 11, 1801. Labrouste attached himself to the Academicians and was always profoundly influenced by classical antiquity, particularly by the Temple of Neptune at Paestum which, as an example of pure Doric, he felt had been largely neglected by architects desiring to build in the classical style. In 1829 he began work on the Beaux-Arts building in Paris and in 1843 undertook the design of the library of Ste. Genevieve and the National Library, both in Paris, three buildings which had a profound effect on later architects. He died at Fontainebleau, June 24, 1875.

LA BRUYÈRE, JEAN DE (1645-96), French writer, was born in Paris, Aug. 16, 1645. He was attached to the Condé household, and spent his life in the company of famous men who, like himself, were patronized by this princely family. When he

published *Caractères,* 1688, he became famous, although he also made enemies, since these essays were filled with maliciously drawn portraits that were easily recognized by the public. For this reason, La Bruyère had to wait until 1693 to be elected to the French Academy. *Caractères* was considered a highly original work, and ran into numerous editions, each of which was augmented with fresh portraits. La Bruyère died of apoplexy in Paris, May 10, 1696.

LABUAN, a British island lying 6 mi. north of BORNEO. It has an area of 30 sq. mi. and was formerly incorporated with Singapore, but since 1912 it has been joined for purposes of administration to the Straits Settlements, 700 mi. away. Labuan is noted for its fine harbor, Victoria. The island was once covered with forests which have been cleared for the land. Rice, pineapples, coconuts, bananas, mangoes and oranges are the principal exports. Pop. 1929, 6,029.

LABURNUM, a genus of poisonous shrubs of the pea family closely allied to the broom. There are three species, natives of the Old World, two of which, with numerous gardeners' varieties, are widely cultivated. These include the golden-chain or bean-tree (*L. anagyroides*) and the Scotch laburnum (*L. alpinum*).

LABYRINTH, a name given to edifices with winding passages from which it is difficult to find a way of exit. One of the largest was on the shore of Lake Moeris in Egypt and was probably built by order of Amenemhat III, 2300 B.C., as a tomb for himself. It was used as a temple, although many of the chambers in its crypt were places of burial. The most famous is the Cretan labyrinth, built by DAEDALUS for King MINOS II of Crete as a place of imprisonment for the MINOTAUR. A similar labyrinth was at Samos, and still another was the tomb of Porsena near Clusium, which was called the Italian labyrinth.

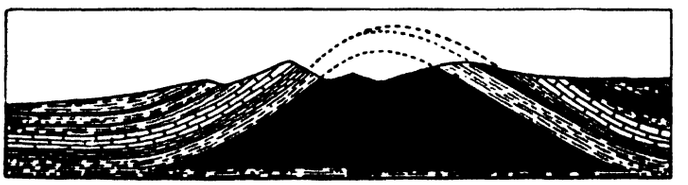
LACCADIVE ISLANDS, a group of 14 islands and coral reefs in the Indian Ocean, lying about 170 mi. off the Malabar Coast. Only nine of these islands are inhabited and the total population is about 13,700. Nearly all the inhabitants are Mohammedans speaking the Malayalim tongue. Coconuts and coir, coconut husk fiber are the staple products. Vegetables and bananas are grown. The Laccadives, which are attached to the Presidency of Madras, were annexed by Great Britain in 1877.

LACCHUS. *See* BACCHUS.

LACCOLITH, a mass of IGNEOUS ROCK which, in a molten condition, has been forced up from below into overlying sedimentary beds. As a result the liquid rock, or MAGMA, has spread out along a plane of weakness between certain beds. The lower remains as a flat floor, while the upper are progressively arched into a great dome. The igneous rock thus forms a great lens-shaped mass, usually roughly circular in plan. Laccoliths may be a few hundred yards in diameter, or many miles across and a mile or more thick. The best known examples are in the Rocky Mountain region. *See also* BATHOLITH; PETROLOGY.

LACE, a delicate openwork fabric, usually having a figured pattern.

The ancient Egyptians made nets and netted fabrics, but so far as is known they made nothing which can

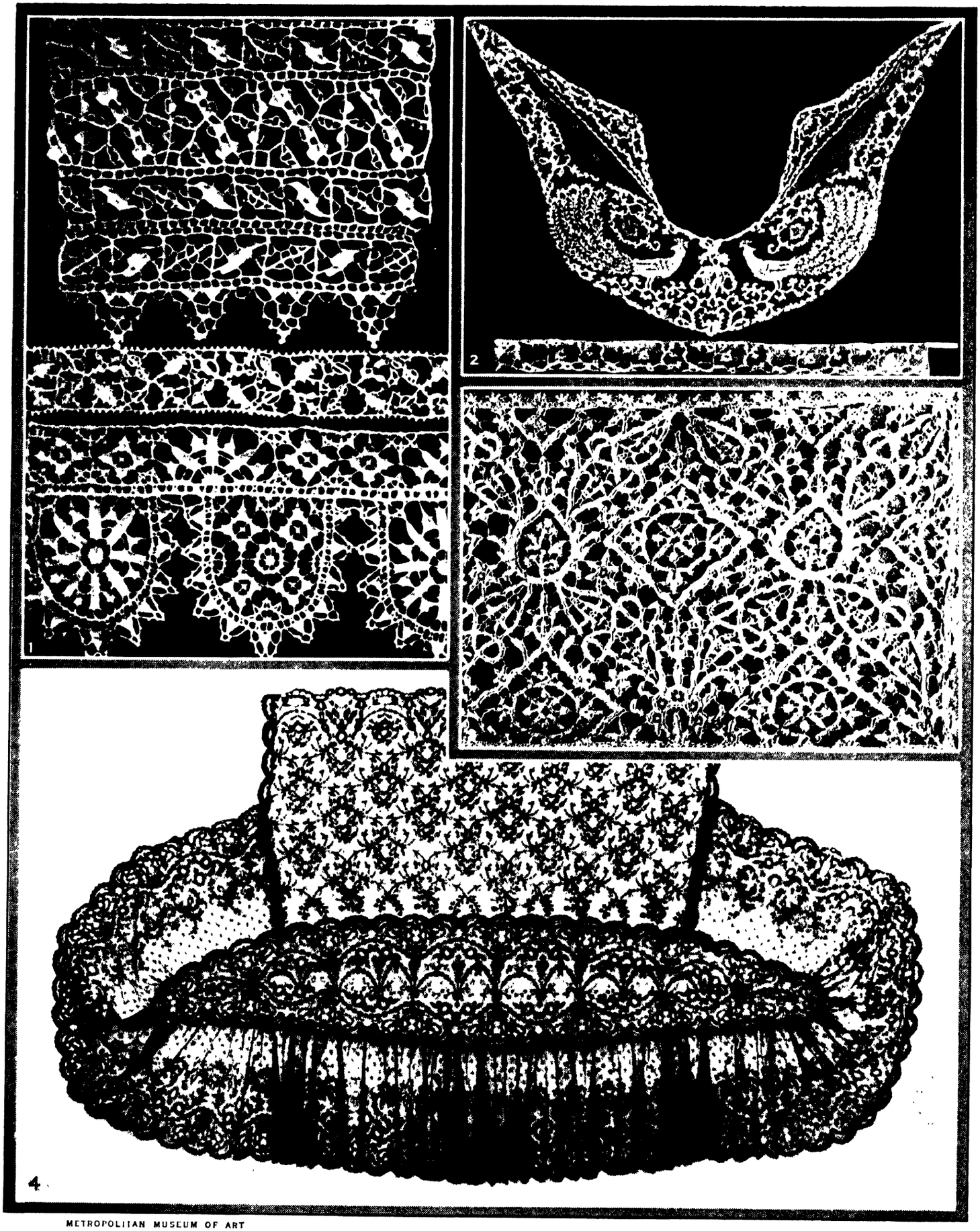


COURTESY U.S GEOLOGICAL SURVEY

CROSS SECTION OF LACCOLITH, BURNETT CREEK, MONTANA

be classed as true lace. There is no reliable evidence to prove the existence of lace before the 15th century, when it evolved from open ground and cut work embroidery and first took the form of darned net or *lacis.* Italy is generally considered the mother of lace. Early in the 16th century exquisite laces, chiefly of the *punti in aere* variety, were being made in Venice by nuns. Catherine de'Medici (1519-89) had great stores of *lacis* which were made by the girls of her household and is said to have introduced lace to France when, in 1585, she arranged for a Venetian lace-maker to come to Paris and set up his looms. The fashion of ruffs stimulated the production of lace in the 16th and 17th centuries and it is interesting to note that men were the principal users of the new fabric in its early days. Cinq Mars left over 300 sets of collars and cuffs at his death in 1642. Lace-making was not practised in England until the 17th century, when the new industry was fostered by Katherine of Aragon. By the last quarter of the 17th century laces were characteristic of localities and came under the general heads of Points de Venise and Points de France, the latter being chiefly copies of Venetian patterns. Leading centers of the French industry were Alençon, Reims, Arras and Sedan. Louis XIV was the great patron of lace in this century, and the artistic character of the lace produced during this period has never been surpassed. Needlepoint reached its highest possible magnificence at this time.

Lace-making. Hand-made laces are of two kinds, needlepoint and bobbin or pillow-made lace. The development of both laces took place during the same period and the discussion as to which came first has been long and heated. In the matter of which locality first produced the respective varieties, priority in needlepoint as well as bobbin is generally conceded to Venice, though Flanders claims the honors in bobbin lace. *Needlepoint lace* is made of fine white thread. Fantastic threads are never used and gold and silver threads are exceedingly rare. In making the lace, a thread is first stitched along the outlines of a pattern, which has been drawn or transferred upon paper or parchment, producing a skeleton thread pattern upon which the pattern is then worked. A design for a large piece of lace is divided into sections of a convenient size for a lace-maker to handle and



METROPOLITAN MUSEUM OF ART

ITALIAN, ENGLISH AND SPANISH LACES

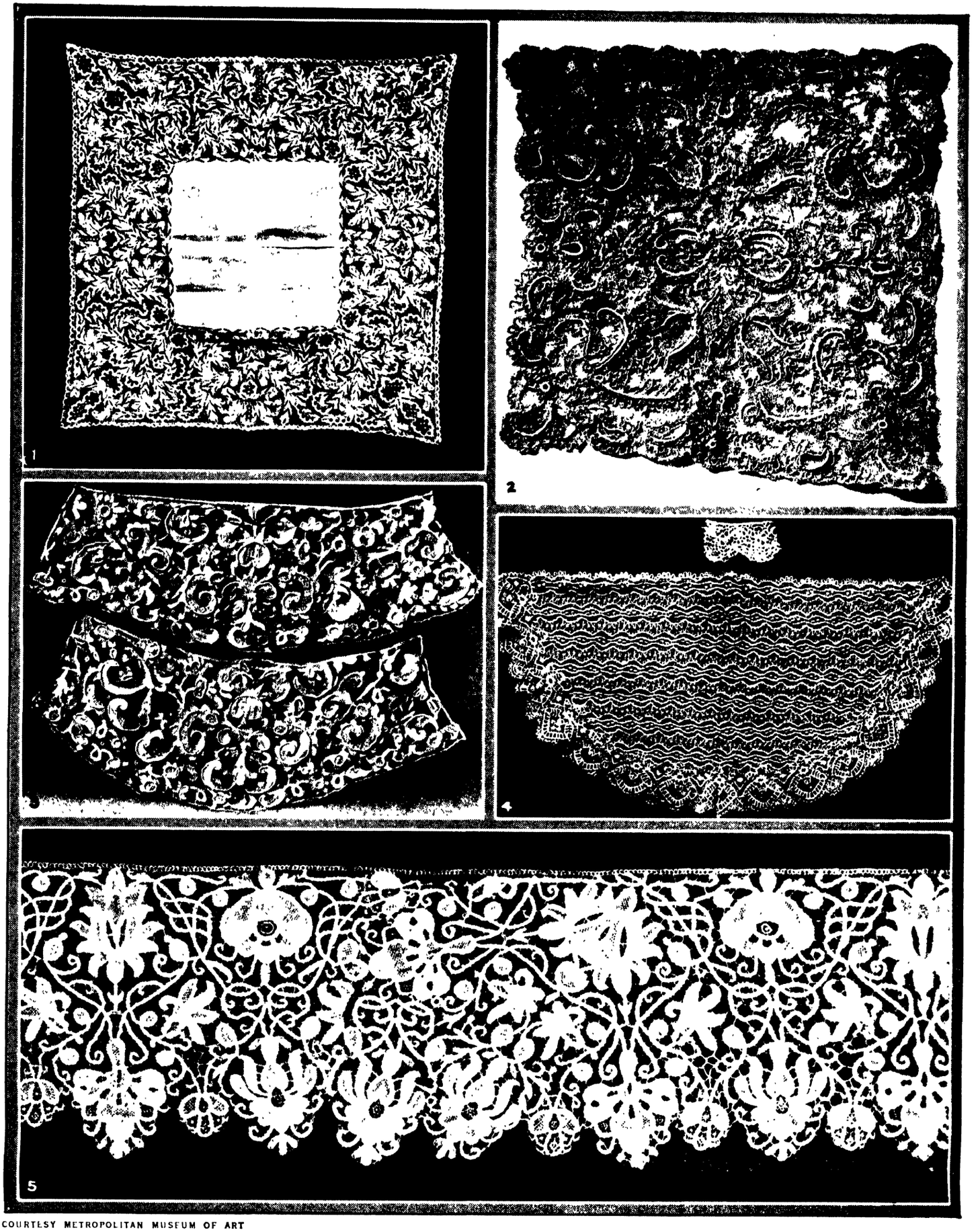
1. Reticella needlepoint lace of the 17th century. **2.** A rare example of English bobbin lace of the middle 18th century. **3.** Spanish cutwork lace of the 16th century. **4.** Spanish black blonde lace, typical of the Peninsula lace-makers.



COURTESY METROPOLITAN MUSEUM OF ART

THE LACE MAKER'S ART IN EUROPE

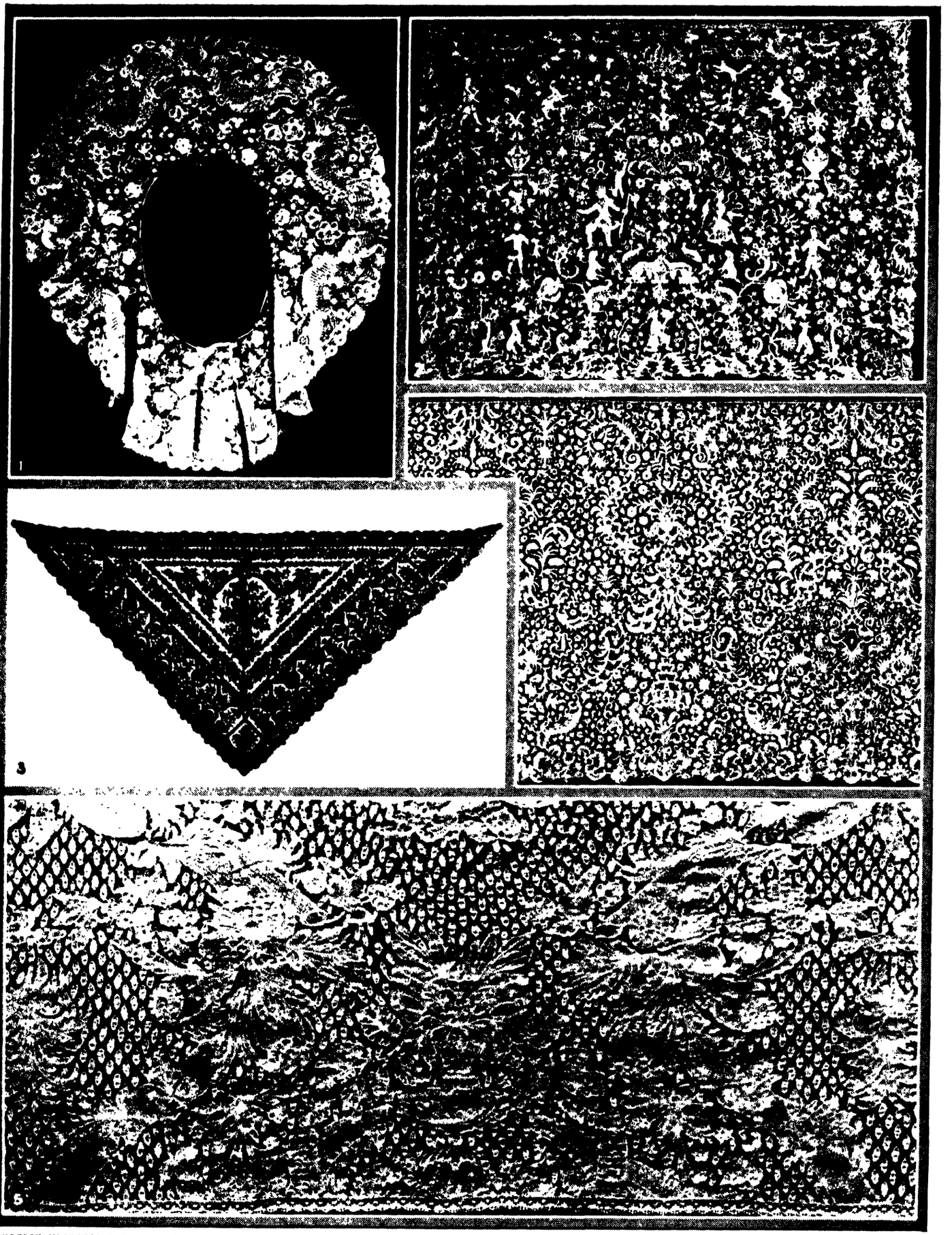
1. Flemish bobbin lace of the late 17th century. **2.** Valenciennes bobbin lace. 19th century. **3.** French *Point d'Alençon.* Middle 18th century. **4.** Italian network lace of the 16th century.



COURTESY METROPOLITAN MUSEUM OF ART

ITALIAN AND ENGLISH LACES

1. Cover edged with Milanese bobbin lace of the 17th century. **2.** Panel of early 18th century Burano needlepoint. **3.** Cuffs of Venetian *gros point*. 17th century. **4.** Bobbin lace veil from Bedfordshire, England. 19th century. **5.** Italian tape and needlepoint (*mezzo punto*) border. 16th-17th centuries.



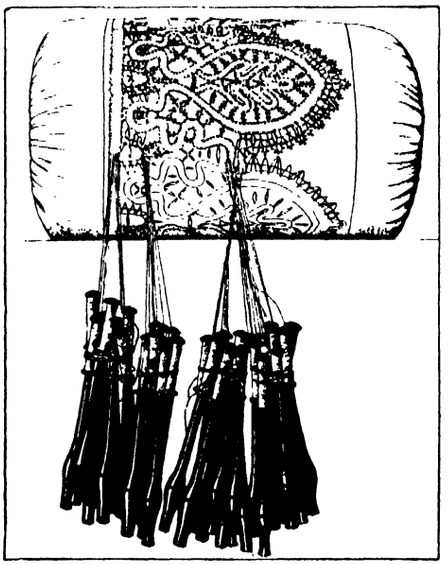
COURTESY METROPOLITAN MUSEUM OF ART

RARE AND EXQUISITE LACES

ssels needlepoint of the 19th century. **2.** *Point de France* needlepoint. Late 17th century. **3.** Shawl of lace. 19th century. **4.** Flemish bobbin lace. 17th-18th centuries. **5.** Flemish *Point d'Angleterre*. 1750.

on completion the several portions are inconspicuously joined by needle stitches.

Bobbin or pillow-made lace. This lace is made by intercrossing and plaiting threads which are wound on bobbins and fastened on a cushion or pillow by means of pins. The pattern over which pillow lace



PILLOW AND BOBBINS USED IN MAKING LACE

is made is traced and pricked on a card or bit of smooth surfaced parchment. The pricked holes show the worker where pins serving as *points d'arret* are to be placed in the formation of the design. The size and shape of the bobbins and pillow vary greatly. A cylindrical pillow is used for bandings. Objects resembling bobbins placed in positions similar to those for lace-making have recently been unearthed in the ancient Roman settlement of Clatema. X.

In *machine-made laces,* the manufacture is confined to four types of machines: (1) Warp lace machines produce nets, netting, tatting, veilings, and curtain material. Knitting machines of the flat type make small narrow edgings, plain in design, for use as trimmings. (2) Nottingham and Levers lace machines produce the bulk of commercial lace, all-over laces, edgings and curtains. These machines were first introduced about 1809 but modern lace manufacturing can only be said to date from 1834 when the Jacquard machine was first successfully applied to them. This attachment eliminated crudeness of design and permitted the reproduction of artistic designs comparable to the beautiful hand made creations. To-day accurate reproductions of the very intricate designs of rose point, Alençon and others equally elaborate can be made on a commercial basis. The term "point" as applied to the manufacture of these laces refers to the degree of fineness or the number of bobbins per inch in the machine. In other words, a coarse seven-point lace would have seven bobbins to the inch while a fine 18-point lace would have 18 bobbins to the inch. (3) Torchon laces are made on special lace braiding machines of two types, one known as the two thread and the other the one thread. Both of these Jacquard lace braiders produce lace of the "Bobbin" type and the finished laces very closely resemble hand made originals. (4) Schiffli laces are the product of a machine bearing the same name. These are made by the embroidery of a design onto a specially prepared background. This background is later burned out or dissolved and the embroidery itself, or lace as it is called, remains. This type of lace is also known commercially as "burned out" lace and Plauen lace.

Strength and durability are requisites of machine-made laces. Choice of the proper "mesh" or background is a factor that plays an important part in the ultimate result. Some common meshes in use are the filet or square mesh, the mechlin mesh, and the valenciennes or diamond mesh. These offer a suitable ground work on which to apply designs. R. P. M.

Outstanding varieties of lace are: *Point d'Alençon,* a needlepoint lace of cobwebby fineness with ground of double twist thread in semi-net effect; frequently horsehair is worked into the edges to give firmness. It is now made by hand in several places in France and Italy and beautifully copied by machines. *Brussels,* a bobbin lace made at and near Brussels, is one of the finest and filmiest of laces. The delicate thread is spun in dark underground rooms as it has a tendency to break in dry air. The design is made first and the background worked around it. A machine-made net background is now frequently used, making machine and hand-made lace easily distinguishable. *Chantilly,* a bobbin lace made of non-lustrous grenadine silk which dates to the early 18th century. Originally it belonged to the "blonde" lace group of laces made of unbleached silk but it is now made in black and white as well as ivory. A double ground distinguishes this lace which has elaborate patterns of vases and baskets with sprays, branches and vines. *Cluny,* a member of the *guipure* family of laces, first made at Le Puy, France. Cluny was originally a needlepoint lace but the modern type is made with bobbins. *Duchesse,* also called *Point de Bruges,* is regarded by many as the most beautiful of pillow laces. It is a *guipure* lace made of pure white thread and has a graceful flowing pattern connected by an occasional "bride." *Filet,* any lace made with a square mesh net with the pattern darned in. This is one of the earliest forms of lace. It is sometimes called Siena Point from the Italian town by that name which was famous for it in the 16th century. *Irish Crochet,* a beautiful and durable lace remarkable for the whiteness of its linen thread and the distinctness of its pattern. It is made with a crochet hook and is in reality an imitation of needlepoint laces of Spain and Venice. *Spanish Lace,* a comprehensive term used to classify several kinds of laces of which the best known is a silk lace, black, white, or blonde, with a well-defined pattern on a fine net background. This is much used for mantillas. *Point d'Espagne,* usually a gold or silver lace embroidered with a colored silk pattern, is the most famous of all Spanish laces and was a great favorite with the old Spanish nobles. *Valen-*

ciennes Lace, a solid and durable bobbin lace, commonly called "Val," and now extensively made by machines.

BIBLIOGRAPHY.—G. Whiting, *Lace Guide for Makers and Collectors,* 1920; C. M. Blum, *Old World Lace,* 1920; E. C. Vanderpoel, *American Lace and Lace-Makers,* 1924.

LACE-BARK TREE (*Lagetta lintearia*), a small tree of the mezereum family native to Jamaica. It grows 20 to 30 ft. high bearing oblong evergreen leaves and clusters of small white flowers. The numerous finely interlacing bast fibers form a gauzy lace-like material used in making dresses and fancy articles.

LACERTA (gen. *Lacertae*), the lizard, a small unimportant constellation between Cygnus, Cepheus and Andromeda. *See* STAR: *map.*

LACE WING FLY, a popular name for various greenish insects of the family *Chrysopidæ.* They are often found on foliage infested with aphis. The eggs are laid singly on elevated silken stalks, so each larva may escape being eaten by its fellows. The larvæ are popularly called aphis-lions because they voraciously devour these pests of plant life. They thus constitute one of the most important groups of insects beneficial to agriculture. Adult flies have beautiful lace-like wings and eyes of a peculiar metallic color. For this reason they are known also as golden-eyed flies.

LACHAISE, GASTON (1882-), American sculptor, was born in Paris, France, Mar. 19, 1882. He studied at L'Ecole Nationale des Beaux Arts, Paris, came to the United States in 1906, and located in New York. He became naturalized 10 years later. He has done much beautiful and original sculpture of women; small bronzes, heads and life-sized figures, the best of which is his bronze figure *Elevation.* Lachaise's work is basically sculptural in his feeling for form and volume, and at the same time sensitive and very much alive. His work is to be seen in many private collections and museums.

LACHES, in law an unnecessary delay in making a claim. A person may have a just claim but delay so long in enforcing it that a court of equity will refuse to allow it. It is governed by the individual circumstance, as, for instance, when changes have occurred in conditions.

LACHESIS, in classical mythology, one of the the three FATES.

LACHINE, a town of Jacques Cartier Co., Quebec, Canada, situated on Lake St. Louis, an expansion of the St. Lawrence, at the junction of Lachine Canal, 8 mi. southwest of Montreal. The Canadian National Railway and Montreal and Great Lakes steamers afford good transportation, and Lachine also contains iron, wire, and engineering works; asbestos and tool manufactures and boatbuilding are among local industries. Attractively placed, the town is a favored Montreal resort. It was named La Chine in 1669 in mockery of La Salle who sought a western passage to China. In 1689 Iroquois Indians massacred the inhabitants. Pop. 1921, 15,404; 1931, 18,630.

LACHRYMAL GLAND, DISEASES OF. *See* EYE, AFFECTIONS OF.

LAC INSECT (*Coccus lacca*), a tiny scale insect of the homopterous family *Coccidæ,* found on trees in the East Indies. The minute larvæ, like red dust, settle on the twigs, and, piercing the bark with their beaks, draw up the sap on which they feed. A resinous secretion, emitted from their pores, hardens and glues them there, and there the females, which form the bulk of the colony, die, making small mounds over the eggs they have laid. Thus the cycle repeats itself, until the twig may be coated half an inch thick. Gathering lac is an important industry among the natives, who bring in the "stick lac," treat it and import it in large quantities to European markets as "shellac." *See* SHELLAC.

LACKAWANNA, a city of Erie Co., N.Y., about 3 mi. from Buffalo. It is an important industrial city, with steel plants, foundries, bridge works, shipyards and refrigerator and dress factories. Lackawanna is served by the New York Central, Pennsylvania, and Buffalo, Rochester and Pittsburgh railroads, and an airport. Pop. 1930, 23,948.

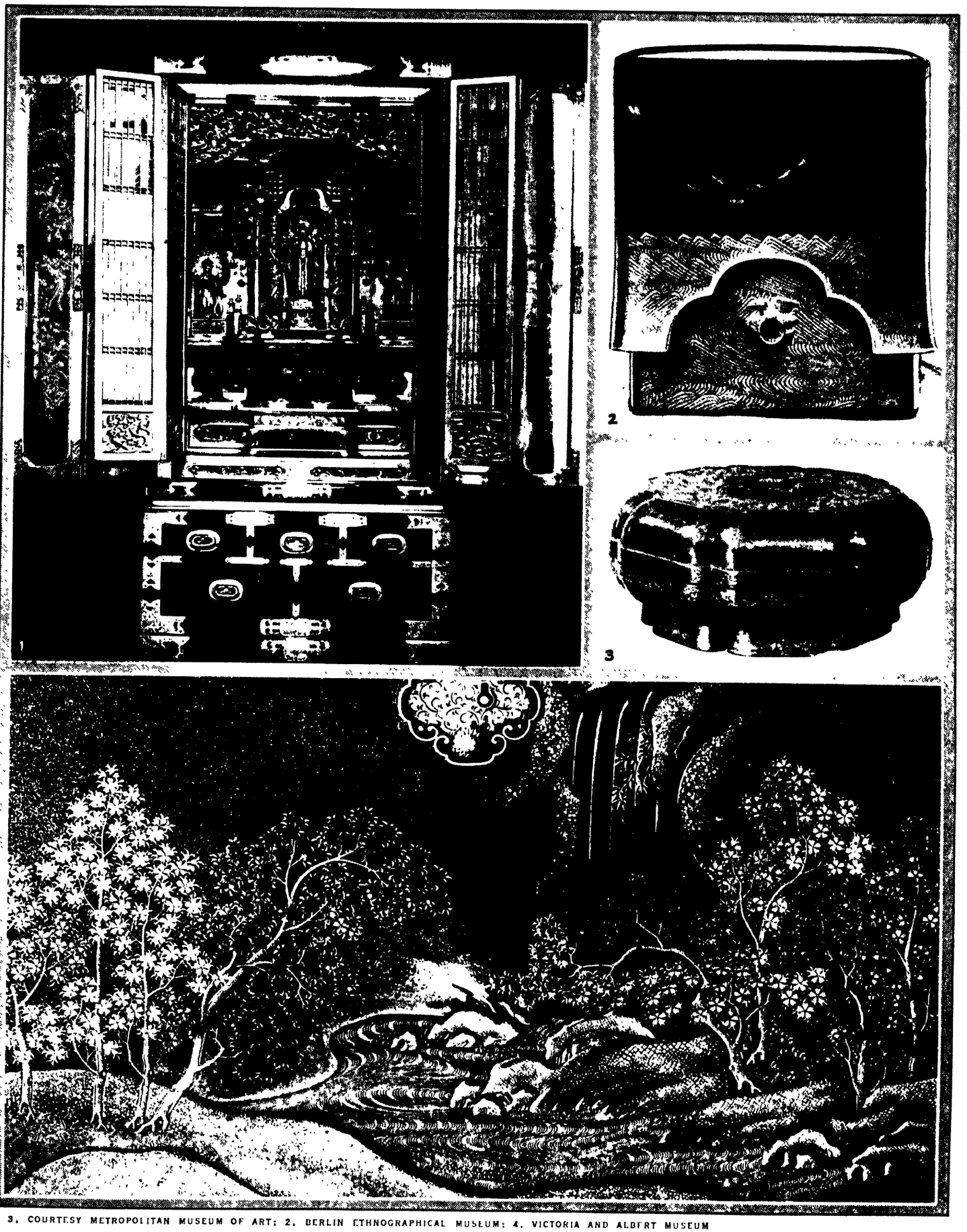
LACONIA or **LACONICA,** a territory in ancient Greece, lying in the southeastern part of the Peloponnesus. The chief city was SPARTA, which reached its greatest power in the 5th century B.C.

LACONIA, a city in central New Hampshire, the county seat of Belknap Co., situated on the Winnepesaukee River, in the foothills of the White Mountains, 32 mi. northeast of Concord. The city is bounded by lakes Winnepesaukee and Winnisquam, and Paugus and Opeechee lakes are within the city limits. It is served by the Boston and Maine Railroad. Laconia is a popular winter and summer resort. The local manufactures include knitting machinery, malleable iron, brass foundry products, hosiery and lumber products. In 1929 the manufactures reached an approximate total of $7,000,000; the retail trade amounted to $5,889,431. The principal crop of the district is apples. In the early days the Indians had fishing weirs here. Laconia was settled about 1761 and chartered in 1893. Pop. 1920, 10,897; 1930, 12,471.

LACQUERS, glossy, varnish-like products applied in thin layers for protective or decorative purposes. They may be divided into two classes, viz., the comparatively thin often transparent substances used generally in Western countries for coating metallic surfaces, and the thick, usually opaque materials, used in China and Japan to decorate objects of wood.

The metallic lacquers consist largely of shellac dissolved in alcohol, with some turpentine, to which has also been added a mixture of resinous substances and dyes or pigments. They are applied in successive thin coatings, usually after pre-heating the metallic surface, and form a protection against the oxidizing and rusting action of the atmosphere, but are not impervious to the fumes resulting from the combustion of fuel, or to tobacco smoke.

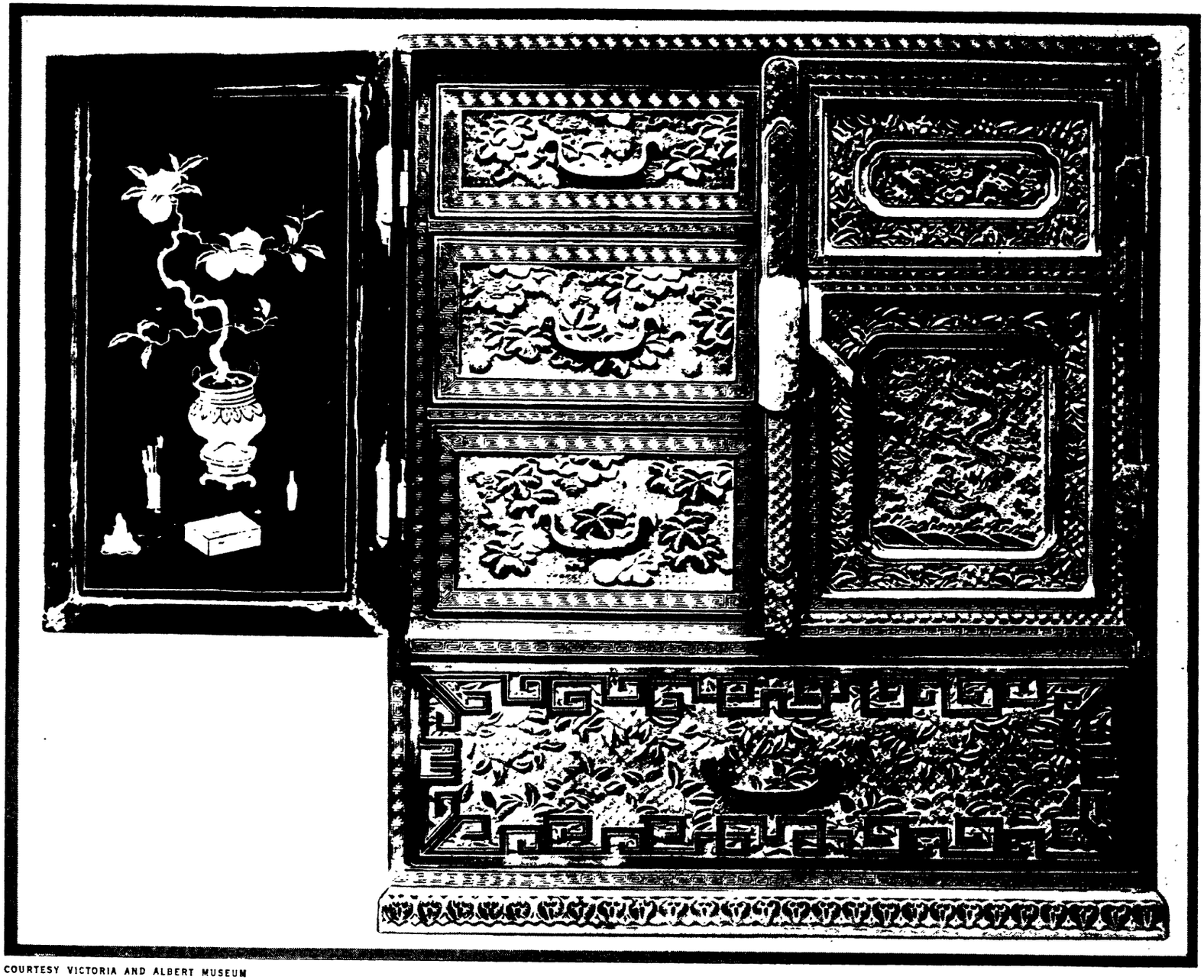
The lacquer of the Far East is obtained from the sap of the lacquer tree, *Rhus vernicifera,* the sap pos-



1, 3, COURTESY METROPOLITAN MUSEUM OF ART; 2, BERLIN ETHNOGRAPHICAL MUSEUM; 4, VICTORIA AND ALBERT MUSEUM

CHINESE AND JAPANESE LACQUER WORK

1. A Buddhist shrine, lacquered in black and gold. Japanese work of the 19th century. **2.** Japanese incense casket in black and gold lacquer. **3.** Chinese lacquered box, K'ang Hsi Period (1622-1722). **4.** Japanese cabinet panel in gold lacquer on Nashiji ground, 18th century work of the Kajikawa School. Cherry blossoms and a waterfall.



COURTESY VICTORIA AND ALBERT MUSEUM

CHINESE CABINET IN CARVED LACQUER

Chinese lacquer work of the 18th century. The outside panels are adorned with flower and dragon ornamentation in relief in a variety of colors. The opened door is in flat lacquer.

sessing the singular quality of drying in moist air, and hardening without becoming brittle. The art of making lacquerware in China and Japan is of very ancient origin. The process involved is extremely laborious and involves the application of several successive coatings to the wood before the real artistic designing and finishing can be undertaken. In these preliminary coatings, crude lacquer may be used, often mixed with finely powdered baked clay, and each layer is dried and prepared for the next by rubbing with a mild abrasive. The later coatings are usually colored; black is obtained by mixing with lampblack or iron "inks"; red by addition of cinnabar, the red sulphide of mercury; olive brown, green and blue are less commonly employed, while for very delicate work a transparent lacquer is sometimes used for all stages, such that the grain of the woodwork may be seen through it. For decoration purposes, silver or gold dust or flakes are often employed, mixed with the upper layers of lacquer, while inlays may be executed with mother-of-pearl, ivory or small fragments of shells, jade, soapstone, or porcelain. In extremely fine lacquerware, figures and designs are carved out in relief in the layers of lacquer, each successive layer having been given a distinctly different color. For the final coating, the very finest lacquer must be used; this is then further rendered glossy by polishing and rubbing with oil and powdered horny substances. The surface ultimately obtained is capable of resisting heat as well as acids, and thus finds extensive application in the East as tableware.

Originally lacquer appears to have been used as a writing fluid in China, but its decorative properties soon made it the ideal material for embellishing all kinds of utensils for temples and ceremonial occasions, furniture, pottery, and even exteriors of buildings. The fact that some of the older memorials have withstood the destructive influence of the weather for many centuries testifies to the extreme durability of oriental lacquer. *See also* PAINT; VARNISH; NITROCELLULOSE. W. J. L.

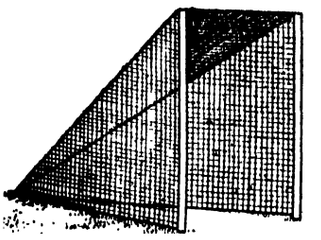


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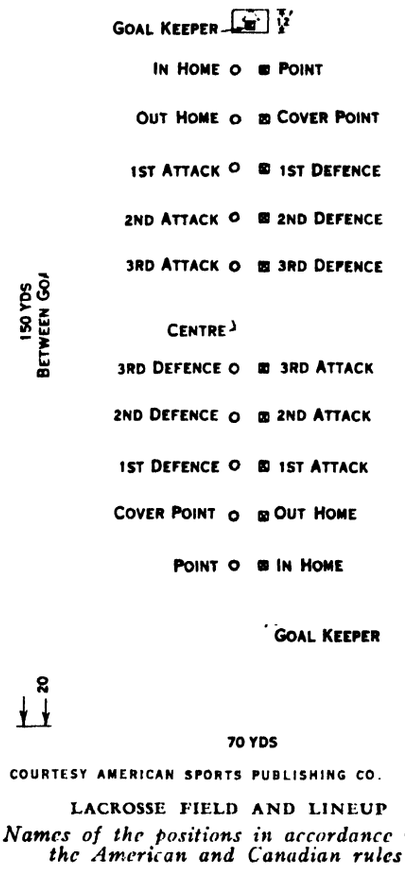
LACROSSE PLAYER

LACROSSE, an outdoor game played by 12 players, each armed with a crosse. The name was given by French colonists in Canada to the inter-tribal Indian sport of baggataway, once a favorite sport of the Iroquois. The game, which antedates the discovery of the New World, was played with a fury second only to the Indian temper in battle. French and English settlers adopted the game and formalized it as a sport. The present game, which is the recognized summer sport in Canada, bears only a slight resemblance to baggataway, but it remains one of the fastest and most strenuous sports of any race.

The crosse is a curved stick, generally made of light hickory. The upper half, including the curve or crook, is strung with hide and clock gut. The hide is used in longitudinal strips, and the clock gut is employed horizontally for meshing the triangular space made by a thong running from the top of the crook to the collar, a point about 2 feet from the lower end of the crosse. The modern crosse is a delicately balanced instrument, capable of receiving the ball at seemingly impossible angles, and of throwing it with remarkable accuracy. The ball, about 8 inches in circumference, is of india-rubber sponge, weighing 5 ounces. Goals, consisting of two square poles 6 feet apart and 6 feet high, joined by a horizontal, are placed between 100 and 130 yards apart on a field generally 80 yards wide. The object is to send the ball through the goal. The ball may be thrown between players in any direction; but no player may interfere with another unless he has the ball or is about to receive it. The positions are: goal-keeper, point, cover point, third, second, and first defense, center, third, second, and first attack, outside home, and inside home. There are intercollegiate games yearly in the United States, and the game enjoys favor in states along the Canadian border.



LACROSSE GOAL NET



COURTESY AMERICAN SPORTS PUBLISHING CO.

LACROSSE FIELD AND LINEUP

Names of the positions in accordance with the American and Canadian rules

LA CROSSE, a city on the western boundary of Wisconsin, the county seat of La Crosse Co., situated on the Mississippi River, at the mouths of the La Crosse and the Black rivers. Bus and truck lines, river craft, air service and four railroads make the city an important shipping center and market for farm crops and lumber. Rubber goods, heating appliances and motor gauges are the chief local manufactures. In 1929 the factory output amounted approximately to $25,000,000; the retail trade reached a total of $24,541,054. A trading post was established here about 1836. La Crosse became the county seat in 1850, and was incorporated in 1856. The Battle of Bad Axe, in the Black Hawk War, took place just north of this site. A few miles south are the remains of Ft. Crawford, once commanded by Zachary Taylor and Jefferson Davis. La Crosse is the seat of La Crosse Vocational School and a State Teachers College. Pop. 1920, 30,421; 1930, 39,614.

LACTIC ACID, an organic acid found normally in sour milk and present to a variable amount in fermenting carbohydrate products. It was discovered by Scheele in 1780. It is manufactured by fermenting a 12% sugar solution containing protein and mineral salts with a specially prepared bacterial culture. The bacteria and acidity gradually increase and the fermentation is completed in about six hours. The acidity of above 2% is continuously neutralized by the addition of lime, and, after the fermentation is completed, the necessary quantity of sulphuric acid is added which results in the liberation of a 20% solution of lactic acid and the precipitation of sulphate of lime. The supernatant liquid is concentrated to 45 per cent. It is straw colored, has a very pleasant sharp taste, but no odor. Lactic acid is used in some baking powders, to a limited extent in bread manufacture and in controlling acidities in the fermentation industries. E. C. T.

LACTONES, organic compounds, formed by elimination of water from α-, β-, γ- and δ-hydroxy-acids, giving internal etherial salts or ethers. The term usually applies to the aliphatic γ-lactones from their ease of formation and stability. The α-, β-, and δ-derivatives are formed with more difficulty. The ease of formation of γ-lactones is so great that it is difficult to isolate the free γ-hydroxy acid. They are usually formed by heating an aqueous solution of the hydroxy-acid. They are neutral, colorless liquids or low-melting solids, distilling without decomposition. Like ordinary esters, they are hydrolysed to free acid and with ammonia form hydroxy-acid amides.

J. E. C.

LACTOSE, commercially known as milk sugar, normally found in cow's milk to an amount of 4.8 per cent. It has the same chemical composition as cane sugar, differing only in molecular constitution and being about one sixth as sweet. Crude milk sugar is obtained from milk by precipitating out the casein and fat with acid, and heating the filtrate with lime to remove foreign matter and finally concentrating the clear filtrate in the vacuum evaporator. The concentrate is cooled, at which time the crude milk sugar crystallizes out. The refined milk sugar is made from the crude product by redissolving and crystallizing. Milk sugar is principally used in baby foods and pill manufacture. The annual production in this country is approximately 9,000,000 pounds. There are about eleven factories in the United States and about 1,700,000 pounds are produced annually in each of the states of California and New York.

E. C. T.

LADD, GEORGE TRUMBULL (1842-1921), American philosopher and psychologist, was born at Painesville, O., Jan. 19, 1842. He graduated from Western Reserve University, 1864, and Andover Theological Seminary, 1869. After teaching at Bowdoin College for two years, he went to Yale in 1881, where he remained until his retirement in 1905. Ladd established the psychological laboratory at Yale and was interested in physiological psychology. He was a disciple of Lotze, and his philosophical position is best summed up in his essay on *Knowledge, Life and Reality,* 1909. His two most important psychological works are his *Physiological Psychology,* 1887, rev. by R. S. Woodworth, 1911; and *Psychology,* 1894. Ladd died at New Haven, Aug. 8, 1921.

LA DÉBÂCLE ("The Downfall"), a naturalistic novel, published 1892, by Émile Zola, depicting the horrors of the Franco-Prussian War. The two chief characters are Jean Macquart, a corporal, and Maurice Levasseur, a young private. The two comrades, after having fought side by side at Sedan, are brought together in Paris during the 1870 revolution, but as enemies. Macquart kills his former friend, and sorrowfully leaves his sweetheart, Henriette.

LADOGA, largest European lake, in northwest Russia, forming the boundary between that country and Finland; its western shore is 40 mi. east of Leningrad. It is roughly quadrilateral in shape, has an area of over 7,000 sq. mi., is 130 mi. from north to south and 80 mi. from east to west. The average depth is estimated at 300 ft. Ladoga is icebound for one-third of the year, and the water is always exceptionally cold and clear. Great masses of ice often pile up and present the appearance of towering hills; in warmer seasons heavy gales cause tremendous waves. Fish are plentiful in its waters and even a species of seal inhabits the lake. Granite cliffs rise on its northern shore, in sharp contrast with the low and marshy southern portion. Ladoga is fed by a great volume of water from many streams; the Svir brings water from Lake Onega; the Sias from the small lakes of the Valdai plateau; the Vuoxen and Taipole from the Saima lakes; and the Volkhov from Lake Ilmen. The River Neva is its outlet into the Gulf of Finland. Sand banks and shoals, frequent fogs and snowstorms are impediments to steamer traffic. The chief towns on its banks are Schlusselburg and Novaya Ladoga. A number of canals leading from the southern shores make navigation possible between Schlusselburg and Leningrad and give the Ladoga some commercial importance.

LADRONE ISLANDS, or Marianne Islands, a group of the Pacific Islands, once a German possession but since 1919 mandated to Japan. Guam, the largest, has been a possession of the United States since 1898. Most of them are densely wooded and the soil produces wheat, cotton, rice, tobacco and coconuts. The total area is 420 sq. mi. and the population in 1929 was 64,819. These islands were discovered by Magellan in 1521. Germany purchased them from Spain in 1899 for a sum of 840,000 pounds sterling.

LADYBIRD BEETLE, the popular name for the many species of small beetles of the family *Coccinellidæ,* known also as ladybugs. Their predaceous habits make them of incalculable value to man. A few species, however, are herbivorous, attacking beans, squashes and other cucurbits. Of these only two occur in this country, the Mexican bean beetle and the squash ladybug.

Adult beetles of this family are readily recognized by their oval or hemispherical forms and their characteristic colors, either red or yellow with black dots, or black with red or yellow dots on the wing covers. The larvæ have relatively long legs, and double-tapering, warty or spiny bodies. They are often spotted with bright colors. When ready to pupate, they usually fasten themselves by their tails to any convenient support; the skin then splits open down the back. The pupa state may be passed in this split skin, or the skin may be forced back about the tail. Adults emerge in a few days. Both larvæ and adults feed upon small insects and insect eggs. They are of especial importance because of their preference for APHIS and SCALE INSECTS.

One of the commonest and most useful eastern species, red with two black dots, often passes the winter in dwellings. Here it is sometimes mistaken for a carpet beetle, and killed. The "twice stabbed" lady beetle, so called because its black back has two reddish spots, is a native of the Pacific coast, where it feeds on various scale insects. The most noted member of this family is the vedalia ladybug, a species introduced into California in 1888 from Australia, to combat the cottony cushion scale on orange and lemon trees. The vedalia ladybug has since been successfully introduced into other citrus fruit regions of the world.

The two injurious species mentioned may be controlled by spraying the under surfaces of the affected foliage with magnesium arsenate. J. R. T.

LADY BOUNTIFUL, in Farquhar's comedy, *The Beaux' Stratagem,* 1707, a kindly old gentlewoman who takes great pleasure in curing the maladies of those around her. The name is applied, often derogatorily, to a woman who dispenses charity.

LADY FERN, the common name for a numerous genus (*Athyrium*) of true ferns comprising about 100 species, found chiefly in tropical and subtropical regions. They are usually of medium size and bear deeply cut, handsome foliage. The common lady fern (*A. Filix-femina*), a tall, soft-foliaged plant sometimes 4 ft. high, grows abundantly in moist woods in the north temperate zone. Numerous varieties with finely cut, crisped or plumy leaves are in cultivation.

LADYFISH (*Albula vulpes*), called also bonefish, a handsome marine fish allied to the herrings, found in most tropical seas and ranging northward to Long Island, San Diego and Japan. The ladyfish is long-bodied, olivaceous above and bright silvery on the sides, with an inferior, rather piglike mouth; it attains a maximum length of 30 in. and weight of 14 lbs. It moves in schools, feeding on the bottom, and although a poor food fish, is esteemed by anglers for its game qualities.

LADY'S SLIPPER, the general name given to a genus (*Cypripedium*) of beautiful orchids. There are about 30 species, all terrestrial, found chiefly in north temperate and subtropical regions, 11 occurring



COURTESY IOWA GEOL SURV.

YELLOW LADY'S SLIPPER

in North America. They are slightly hairy perennial herbs rising from tufted fibrous roots, bearing numerous broad leaves and large, showy, usually solitary flowers. The inflated lip (*labellum*) of the flower forms a slipper-like structure. Various insects, chiefly bees, entering the hollow labellum, are unable to escape except through the openings at its base. In so doing they brush against the stigmas and then the anthers, thus effecting cross-pollination. The native North American species include the showy lady's-slipper (*C. reginæ*), the yellow lady's-slipper (*C. parviflorum*), the ram's-head lady's-slipper (*C. arietinum*) and the California lady's slipper (*C. californicum*).

LADYSMITH, a town of Natal, UNION OF SOUTH AFRICA, 200 mi. northwest of Durban by rail. It was founded in 1851, and is named for a colonial governor's wife. There are important car shops in the town. Pop. 6,783.

LADYSMITH, THE SIEGE OF (1899-1900), one of the great conflicts in the South African War, 1899-1902. Sir George White's forces, inclusive of reserves, amounted to over 13,000 men. The Boers,

gathering a force of 22,000, did not attempt to rush Ladysmith, as the British feared, during the first days of the battle when the town was still practically unfortified. Instead they invested the town on all sides to prevent the escape of White's army. The valleys encircling Ladysmith provided the Boers with an outer circle of defenses, and made a change from the defensive to the offensive difficult to execute. The long stale-mate of the siege lasted 118 days. Advance was difficult. The heaviest encounter was Jan. 6, on the ridges of Waggon Hill and Caesar's Camp, which dominated the whole of the town and of the western defenses. Finally Gen. Buller forced the Boers to raise the siege and retreat after making a last stand at Peter's Hill. On Feb. 28 the British entered Ladysmith.

LADY TEAZLE, in Sheridan's *School For Scandal,* 1777, the lively, naïve, young wife of old Sir Peter Teazle. She frolics in London society, fancies herself a wit, has an affair with Joseph Surface, but is finally tamed by her husband.

LAËNNEC, RENE THEOPHILE HYACINTHE (1781-1826), French physician, born at Quimper, Brittany, February 17, 1781. After studying in various military hospitals and at Paris, he became physician in the Hôpital Beaujon in 1806, and chief physician to the Hôpital Neckar in 1816. Laënnec made his name immortal by the invention of the stethoscope, in 1819, and by publication of his *Traité de l'auscultation mediate* in 1819. Laënnec was the first to describe and differentiate bronchiectasis, pneumothorax, hemorrhagic pleurisy, pulmonary gangrene and a form of cirrhosis of the liver. He left masterly descriptions of bronchitis, peritonitis, and pneumonia, with a full account of the pathologic appearances. He established the etiologic unity of tuberculosis and has been called the greatest of teachers on pulmonary tuberculosis. He was the originator of many terms for well recognized signs in the examination of the chest. Laënnec died near Douarnenez, Finistère, Aug. 13, 1826. A statue was erected to his memory in 1868 in the Place Saint Corentin, Quimper. M. F.

LAERTES, in Greek mythology, son of Acrisius and Chalcomedusa, husband of Antecleia, and father of Odysseus, was king of Ithaca. He joined the Calydonian hunt and the Argonautic Expedition. Athena renewed his youth when Odysseus returned from Troy.

LA FARGE, CHRISTOPHER GRANT (1862-), American architect, was born at Newport, R.I., Jan. 5, 1862, the son of John La Farge. Educated at the Massachusetts Institute of Technology, he worked in the office of architects until 1883, when he formed a partnership with G. L. Heins. He was placed in charge of many important buildings throughout the country, including the Cathedral of St. John the Divine, New York City; Church of the Blessed Sacrament, Providence; St. Paul's Church, Rochester; Houghton Memorial Chapel, Wellesley; Packard Memorial Library, Salt Lake City; and the buildings of the New York Zoological Park. He served as trustee and secretary of the American Academy in Rome and member of the advisory boards of the Schools of Architecture of Princeton University and the Massachusetts Institute of Technology.

LA FARGE, JOHN (1835-1910), American artist, was born in New York City, Mar. 31, 1835. During a period of travel abroad he became greatly interested in the work of the Barbizon School and the English Pre-Raphaelites, and on returning he took up the study of art under William M. Hunt. In 1876 he was chosen by the architect H. H. Richardson to execute the mural decorations for Trinity Church, Boston, and in this field he led the way for American artists. One of the finest examples of mural painting in this country is the *Ascension* painted by La Farge for the Church of the Ascension in New York. The artist was also a pioneer in another field, that of stained glass of the kind known as opalescent. Of many windows designed by him the most important is the *Battle Window* in Memorial Hall, Cambridge. His versatility is shown in such paintings as *The Three Kings* in the Boston Art Museum, *The Muse of Painting* in the Metropolitan, *Autumn* and *The Golden Age* in private collections. La Farge wrote a number of books on art, including *Considerations on Painting.* He died in Providence, R.I., Nov. 14, 1910.

LA FAYETTE, MARIE JOSEPH PAUL IVES ROCH GILBERT DE MOTIER, MARQUIS DE (1757-1834), French soldier, statesman and outstanding figure in three revolutions, born at the Château of Chavaniac in Auvergne, of the younger branch of an old and noble family, Sept. 6, 1757. Two years later, his father was killed at the battle of Minden, and he was only 13 when his mother died leaving him an orphan, and the heir to a large fortune. At 16 he married Adrienne de Noailles, who likewise belonged to an old, aristocratic family.

Though he entered the army, La Fayette's chief allegiance was to the ideas of the liberal philosophy then current. When the American colonies revolted from England, he sympathized ardently with their cause. Later he wrote, "As soon as I learned of this quarrel, my heart was enlisted in it." Despite the pleas of his family and friends and the orders of government officials, La Fayette sailed in April, 1777, on a ship fitted out by himself, to lend his services to the Colonies. In July, the Continental Congress voted him the rank of major-general. From the first, Washington and La Fayette were firm friends. La Fayette was wounded at Brandywine (1777), escaped capture at Barren Hill and took part in the battle of Monmouth (1778), and by his personality, courage and ability, he won the respect of the army and of Congress.

After the alliance between France and the United States was concluded (1778), La Fayette returned to France (1779) to regularize his position in the eyes of the French government. He was received with acclaim at Paris and Versailles, for even the Queen found this youthful, zestful, republican marquis intriguing. After a year in France, he returned to

America to take up again his military career. Reluctantly, he took part in the trial of André. In 1781, he was prominent in the siege of Yorktown, which practically ended the land-fighting of the war.

Early in 1782, La Fayette was in France again. From the king, he received the rank of *maréchal de camp* in the French army. To the American diplomats, he was of some help in negotiating the terms of the peace. A year after the treaty of peace was signed, La Fayette re-visited America where he was received with delight by his war-time friends. From 1784 to 1787, he traveled about Europe. In the latter year he was appointed to the Assembly of Notables summoned by the king. In that body, he urged sweeping liberal reforms. Two years later (1789), he was elected to the Estates-General of which the meeting marked the beginning of the French Revolution. It was La Fayette who proposed a Declaration of the Rights of Man, as a platform of liberal principles.

In July, 1789, he was chosen by the people to lead the National Guard of Paris, which was just being organized. It was at this time that, by a happy compromise between the white of the Bourbons and the red and blue of Paris, La Fayette created the tri-color of revolutionary France. His duties in Paris kept him from the momentous deliberations of the National Assembly at Versailles. In October, circumstances forced him to join the "march of the women" on Versailles, although he disapproved such demonstrations and sought to protect the king and queen from humiliation. As time went on, La Fayette's position became more difficult. For France, he approved of a constitutional monarchy as more practical than a republic, but the king and court distrusted him. On the other hand, the radical leaders of the revolution came to look upon him as a conservative supporter of the monarchy. The middle ground on which he stood became less and less tenable. Twice, he was called upon to suppress riots of the populace, and thus still further lost favor with the radicals.

Early in 1792, he was placed in command of one of the armies organized to resist an Austrian invasion. By June, the events in Paris had convinced him of the danger from the radicals, and he denounced the Jacobins by letter and in person. Before the end of August, the royal family was in prison and La Fayette had been declared a traitor. After some wild gestures toward a counter revolution he left his army and fled across the French border. Captured by some Austrian soldiers, he was imprisoned for five years in Austrian prisons. The harsh treatment he received abroad and the fall of the Jacobins at home rekindled the enthusiasm of the French for La Fayette. In 1797, his release was made a clause in the treaty of Campo Formio.

Once more in France (1799), La Fayette did not oppose Napoleon until 1802. Then, feeling that the life-consulate would lead to tyranny, he voted against it and went into retirement for the next 12 years. During the Hundred Days (1815), he was a member and leader in the Chamber of Representatives. Under the restored monarchy, he was, for six years (1818-24), a deputy, working against the reactionaries and for the liberals. When the government prevented his re-election in 1824, he made up his mind to visit America again. In the United States, he was hailed with the wildest enthusiasm. Balls, banquets, receptions, honors and gifts rained upon him. He was entertained by all the leading people from Jefferson to Jackson. Never, perhaps, did the republic so outdo itself to honor one man.

After more than a year of adulation, he returned to France and was elected a deputy again. When the July Revolution of 1830 started, its leaders saw the advantage of a figure-head. They persuaded La Fayette that a monarchy under Louis Philippe was the nearest possible approach to a republic. When, in August, La Fayette and the new king embraced each other on a balcony before a cheering crowd, the great French Revolution seemed to have set the seal of its approval on the new one. During the next year, however, La Fayette was pushed aside by the new government. Disappointed, he went again into opposition, but his life was drawing to a close. He died on May 20, 1834. His wife had died more than 15 years before. His son, George Washington Motier de La Fayette (1799-1849), achieved some military and political distinction. C. W. C.

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LA FAYETTE, MARIE-MADELEINE, COMTESSE DE (1634-92), French writer, was baptized at Paris, Mar. 18, 1634. Educated by Menage, she acquired Greek, Latin and Hebrew. She was lady-in-waiting to Henriette, Duchesse d'Orléans, after whose death she lived apart from the court. An intimate friend of MADAME DE SÉVIGNÉ and LA FONTAINE, she was known as "Feliciane" to her circle of *précieuses.* Her liaison with LA ROCHEFOUCAULD lasted from 1665-80, and, broken-hearted at his death, she sought consolation in religion. *La Princesse de Montpensier,* 1662, and *Zayde,* 1670, are among her famous novels. La Fayette died in Paris, May 25, 1692.

LAFAYETTE, a city of Indiana and county seat of Tippecanoe Co., on the Wabash River, about 60 mi. northwest of Indianapolis. Its transportation facilities include the Wabash, Big Four, Nickel Plate and Monon railroads, and motor bus and air lines. The city is an important trading center in the upper Wabash basin and has pork-packing and grain-handling industries. In 1929 the factory output was worth about $13,000,000; the retail trade amounted approximately to $19,830,000. Purdue University, established here in 1869, has a well-equipped engineering school. About 7 mi. north of Lafayette, Tippecanoe Battlefield, owned by the state, contains a monument commemorating the defeat of the Indians under Tecumseh by Gen. W. H. Harrison, Nov. 7, 1811. Southwest of the city is the site of Ft. Ouiate-

non, a French military post, established around an Indian village in 1719. This was captured in turn by the English and by the Indians in 1760, and destroyed in 1791. Lafayette was first settled in 1820 and was incorporated in 1854. Pop. 1920, 22,486; 1930, 26,240.

LAFAYETTE, a city in southwest Louisiana, the capital of Lafayette Parish, situated on Vermilion Bayou, 60 mi. southwest of Baton Rouge. The Southern Pacific Railroad and bus lines serve the city, and there is a municipal airport. The principal crops of the district are sugar-cane, corn, rice and cotton. Oil-fields, sulphur and salt deposits are found in the region. The local manufactures are sugar, cottonseed oil and lumber products. In 1929 the retail trade reached a total of $6,190,707. The city has an elevation of about 40 ft. and during the floods of 1927 the inhabitants of the surrounding country fled to Lafayette for safety. Near by is St. Martinsville where Evangeline is buried. Lafayette was settled in 1770 by André Martin, an exiled Acadian. It was founded as a village in 1804 and was first known as Little Manchac and later as Vermilionville. The name was changed in honor of General Lafayette. Pop. 1920, 7,855; 1930, 14,635.

LAFAYETTE COLLEGE, at Easton, Pa., an institution for men, was chartered in 1826 by the Commonwealth of Pennsylvania, and named by the citizens of Easton "as a testimonial of respect for the talents, virtues, and signal service of Gen. Lafayette in the great cause of freedom." The institution became affiliated with the Presbyterian Church in 1849. It had productive funds in 1931 amounting to $3,494,225. The library contained 81,339 volumes. In 1931-32 there were 994 students and a faculty of 112, headed by Pres. William M. Lewis.

LA FOLLETTE, ROBERT MARION (1855-1925), American legislator, was born at Primrose, Dane Co., Wis., June 14, 1855. Graduating from the University of Wisconsin in 1879, he joined the Republican Party, was admitted to the bar, and served as District Attorney of Dane Co. from 1880 to 1884. In 1885 he was elected to the House of Representatives. He was reelected to the next two Congresses, and during the last was a member of the Committee of Ways and Means where he opposed the high rates of the McKinley tariff.

During these six years La Follette's allegiance to progressive and liberal policies became more pronounced. Upon his return to Wisconsin he devoted himself to state politics as the champion of a progressive policy of regulation of the railway and utility corporations and of the extension of popular control of the state government. Elected Governor in 1900 he carried through restrictive regulation and taxation laws against utility corporations and forced the enactment of the direct primary, and by the time of his election to the United States Senate in 1905, after three terms as governor, he had organized a powerful progressive faction of the Republican Party in Wisconsin which with minor defeats has controlled the state ever since.

Although a delegate to the Republican National Conventions of 1896 and 1904 it was not until his return to Washington that La Follette definitely entered the arena of national politics as the leader of the agrarian progressive Republicans. He successfully fought for stricter control of the railways by the Interstate Commerce Commission, improved working conditions for seamen, and generally for legislation favorable to labor interests. He supported the income tax, but failed in his attempts to secure a reduction of the tariff schedules. La Follette was one of the organizers of the Progressive Republican League in 1912, and had the support of that organization for the Republican presidential nomination until Roosevelt entered the race. La Follette refused to support Roosevelt.

With the approach of war, La Follette frankly took his stand as a pacifist, opposed the bill to arm merchant ships, and voted against the declaration of war. With the conclusion of peace he joined but did not lead the fight in the Senate to block ratification of the Versailles Treaty, being opposed to American entrance into the League of Nations under any conditions.

With the gathering suspicions of corruption in the Administration of President Harding it was La Follette, in association with Senators Walsh and Wheeler of Montana, who after a long parliamentary fight forced the investigations which disclosed the corruption in the Departments of Justice and the Interior. Disgusted by these conditions, and becoming sceptical of the possibility of making progress through the framework of the Republican Party, La Follette in 1924 ran as an independent candidate for President upon the Farmer-Labor-Socialist ticket with Senator Wheeler as his running mate. In the prosperity and easy credit of the summer of 1924 his campaign was hopeless from the start, but he polled four and one half million votes and carried the 13 electoral votes of Wisconsin. Worn by a life of active politics and by the great strain of his campaign, he died at Washington, D.C., June 18, 1925.

La Follette was a man perhaps too prone to see only vicious motives in his opponents, but he fought courageously for what he considered right, at whatever cost to himself. In all his political battles he championed the right of the electorate to share more directly in the control of the government and he urged the voters to curb the "interests," which, he insisted, were seeking to exploit the national resources for the benefit of the few.

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LA FONTAINE, JEAN DE (1621-95), French poet, was born at Château-Thierry, July 8, 1621. He entered a seminary, but religious life was not to his taste, and he withdrew. Unhappily married, he settled in Paris, leaving his wife and son at Château-Thierry. From the first, La Fontaine was successful in attracting rich patrons, and he needed them, for

by nature he was exceedingly childlike and improvident. In 1668 his first collection of *Fables* was published, the second appearing 10 years later; they brought him wide and lasting fame. The fables he tells in verse please children because of the vividness of the story, while they are equally relished by the old for their pointed comments on human nature. La Fontaine died in Paris, Apr. 13, 1695. *See also* FABLE; FRENCH LITERATURE.

LAFORGUE, JULES (1860-87), French poet, was born at Montevideo, Uruguay, Aug. 22, 1860. For some years he was reader to the Empress Augusta, in Berlin. His dull life, embittered by poverty, and his deep philosophic study, influenced his ironic verse, which is unlike that of any other poet. Some of his lines, such as *"Hélas! que la vie est quotidienne!"*, have become familiar quotations. His prose is as unique as his decadent symbolistic verse; his *Six Moral Tales,* translated by Frances Newman, is noteworthy. Laforgue died in Paris, Aug. 20, 1887.

L'AFRICAINE. *See* AFRICAINE, L'.

LAGERLÖF, SELMA OTTILIANA LOUISA (1858-), Swedish novelist, was born at Marbacka in Vermland, Nov. 20, 1858. She has told the story of her childhood in *Marbacka,* a book which takes its title from the estate where her family had lived for hundreds of years. The Vermland district, in which the estate lies, is the scene of many of her novels, notably of her first and best known book, *Gösta Berling's Saga.* She returned to this scene in several later novels also, in *Liliecrona's Home* and in the trilogy entitled *The Ring of the Löwensköld*s. Among her other books are *Invisible Links, The Queens of Kungähalla, The Miracles of Anti-Christ, From a Swedish Homestead, Jerusalem, The Wonderful Adventures of Nils, Christ Legends, The Treasure, The Emperor of Portugallia, The Driver* and *The Outcast. The Saga About a Saga* tells the story of her own development. Selma Lagerlöf was awarded the Nobel Prize for Literature in 1909, and in 1914 was elected to the Swedish Academy. Her excellent style, her clear and wide vision, and her beautiful, understanding portrayal of simple life and character place her high among Swedish writers. *See also* SCANDINAVIAN LITERATURE.

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LA GRANDE, a city in northeastern Oregon, the county seat of Union Co., situated on the Grande Ronde River, at the foot of the Blue Mountains, 50 mi. southeast of Walla Walla, Wash. It is served by the Union Pacific Railroad. La Grande is a trade center in a region devoted to lumbering, grain growing, stock raising and dairying. The principal manufactures are lumber products. The city is surrounded by national forests. Southeast of here is Hot Lake, a health resort. It is the seat of the Eastern Oregon Normal School. Pop. 1920, 6,913; 1930, 8,050.

LAGRANGE, JOSEPH LOUIS (1736-1813), French mathematician and astronomer, was born at Turin, Italy, Jan. 25, 1736. At the age of 19, while professor of mathematics at the Turin Artillery School, he published the foundation upon which he later erected his calculus of variations. He obtained European fame and in 1766 was called to Berlin by FREDERICK THE GREAT as director of the mathematical section of the Berlin Academy. In 1787 he returned to Paris as a member of the Academy. After the Revolution he was instrumental in establishing the metric system. He was made a Count by Napoleon. Lagrange's work covered studies of the librations of the moon and the planetary satellites, exposition of analytical mechanics, functional analysis, differential calculus and theory of numbers. Lagrange was recognized as the greatest mathematician of his day. He died at Paris, Apr. 10, 1813.

LA GRANGE, a city in western Georgia, county seat of Troup Co., situated near the Chattahoochee River, 71 mi. southwest of Atlanta. Bus lines and two railroads serve the city. The Callaway Airport-Standard is located here. Cotton, grain and dairy products are produced in the vicinity. Cotton, cottonseed oil and lumber are the chief manufactures. In 1929 the total factory output was approximately $21,000,000; the retail trade amounted to $6,262,537. Not far from the city is "Burnt Village," the last stand of the Muscogee Indians. There was fighting in this region after the close of the Civil War between the two armies who, through faulty communication, had not heard that peace was declared. La Grange was founded in 1828. Pop. 1920, 17,038; 1930, 20,131.

LA GRANGE, a suburban residential village in Cook Co., northeastern Illinois, situated 14 mi. west of Chicago. It is served by the Chicago, Burlington and Quincy Railroad and electric lines. A large aluminum factory is the only important industry in this predominantly residential community. In 1929 the retail trade amounted to $5,563,583. Nazareth Academy, St. Joseph's Institute, Broadview Seminary, and the State Masonic Orphans' Home are located here. Pop. 1920, 6,525; 1930, 10,103.

LAGUNA, an Indian pueblo in New Mexico, located near the San Jose River in Valencia Co., about 67 mi. west of Albuquerque. It is the most recent of the New Mexico pueblos, having been founded on July 4, 1699 by refugees from ACOMA, Zig, Cochiti, and ZUNI who fled from the Spanish after the suppression of the Pueblo Revolt. The inhabitants represent four linguistic stocks, KERESAN, Tauvan, SHOSHONEAN and Zunian. Although situated in an arid region the Indians, by means of irrigation, produce sufficient food and do some wool growing. The population is approximately 1,450.

LAHORE, the capital and chief city of the Punjab, India, on the left bank of the Ravi River. It is a large railroad center and lies in a fertile area whose chief products are cotton and grain. Divided into an old and new town, Lahore has beautiful Hindu temples and Mohammedan mosques as well as many modern buildings. Located here are Punjab University, Lahore Medical College, a library and many other public institutions. The leading manufactures

include textiles, metal goods, pottery and carpets. Lahore was one of the greatest cities of Asia during the ascendancy of the Mogul Empire, and many monuments remain of its earlier glory. Pop. 1931, 429,403.

LAIBACH or **LJUBLJANA,** the chief city of the former province of Slovenia, YUGOSLAVIA, situated on the Ljubljana River, about 50 mi. northeast of Trieste. Ljubljana has for many years been the center of Slovene culture and national movements. Students from the entire Yugoslav kingdom and from other Slavic countries come to Ljubljana for education, as its facilities include a variety of educational institutions.

Laibach was founded by the Emperor Augustus in the 1st century B.C., and was called Emona or Aemona by the Romans. The Magyars were defeated here in 914. Having been governed by the dukes of Carinthia and by Ottokar of Bohemia, the city was taken by the Hapsburgs in 1277.

Industrially, Laibach is no less important. There are tanneries, brickfields, breweries, bell foundries, and match, chemical, cotton, woolen, tobacco, soap and paper factories. A horse fair is an annual event. Pop. 1931, 59,768.

LAIBACH, CONGRESS OF, a congress of the Powers of the Quadruple Alliance in 1821 following the Congress of Troppau of 1820, at which they had proclaimed the right of intervention against revolution in any state if the revolution threatened the tranquillity of neighboring states. At Laibach the Powers concerned themselves particularly with the affairs of Naples, where the King, Ferdinand I, had been forced to accept a liberal Constitution. On the invitation of the monarchs, Ferdinand, despite the protest of his advisers, accepted the invitation. Hardly well started on his way, he renounced his oath and the Constitution, an act gladly endorsed by reactionary sovereigns when he arrived at Laibach. They decided on active intervention, and an Austrian army was sent to Naples to suppress the Constitution, and restore absolutism and Ferdinand. Another was sent into Piedmont to stamp out the revolution in that state.

LAISSEZ-FAIRE, the maxim or principle in economics of let-well-enough-alone expressive of the opposition to state intervention in the normal play of economic forces. The philosophic basis of the maxim was Rousseau's theory (*see* J. J. ROUSSEAU) of the Social Contract. ADAM SMITH in his book the *Wealth of Nations* first familiarized the public with the assumed dangers of state intervention by citing the evil consequences of mercantilism, protection and the like. DAVID RICARDO in 1817 enunciated the doctrine of the eminent superiority of unrestricted competition as regulated by the laws of SUPPLY AND DEMAND. JEREMY BENTHAM in 1845 insisted that government should step out of the sunshine of industry. The English policy of free trade is an obvious illustration of the popularity of the laissez-faire doctrine in England. CHARLES DARWIN's *Origin of Species* (1859) added biological evidence as to the beneficial effects of trusting to the blind laws of competition and resulting in the survival of the fittest. The ever-increasing governmental regulation of industry in recent generations would seem to indicate a growing belief in the breakdown of the policy of laissez-faire. The phrase seems to have originated in France in the period before the French Revolution and was much used by those French economists who called themselves physiocrats.

LA JOLLA, a town in San Diego Co., southern California. It is situated on the Pacific Ocean, 15 mi. northwest of San Diego, and is served by bus and truck lines and the Santa Fé Railroad. La Jolla is a summer and winter residential resort. Marine biological laboratories are located here and it is the site of Scripps Institute of Oceanography.

LA JUNTA, a city in southeastern Colorado, the county seat of Otero Co., situated on the Arkansas River, 63 mi. southeast of Pueblo. The city is a division point of the Santa Fe Railroad. It is a market center in the irrigated belt. The chief products of the region are watermelons, cantaloupes, sugar-beets, live stock and dairy products. Industries include railroad and machine shops and packing houses. Several Indian trails met at La Junta and it became a trading post on the old Santa Fe Trail. The name is the Spanish for meeting place. Pop. 1920, 4,964;

LAKE, an inland body of still water cut off from direct communication with the sea. Lake waters are usually fresh. Landlocked lakes, however, sometimes become dense with salt, sometimes denser than the ocean itself, and are often called seas. The largest of true lakes is the somewhat saline Caspian Sea.

Lakes result from some interference with drainage, such as a natural dam impounding a stream, or a depression in the earth's surface. They are most numerous in regions of former glaciation where they fill rock-basins gouged out by the ice, or valleys dammed by drift. Minnesota alone possesses some 10,000 lakes of glacial origin. Among other types are so-called relic lakes, formed when landward arms of the sea are isolated by a rising coastline or by river-built bars or deltas; curved oxbow lakes occupying abandoned meanders of winding streams; crater lakes formed in the calderas of extinct volcanoes; and lakes filling rift valleys, or the sink holes of limestone regions.

Lakes are ordinarily small, but a few are of great extent. The Great Lakes of the United States and Canada form the largest chain of lakes in the world, with a volume of 5,500 cu. mi., and a combined area exceeding that of the island of Great Britain. In general lakes are larger than ponds, but in some regions, like New England, the term pond is applied to good-sized lakes. The majority of lakes are under 50 ft. in depth. The deepest lake in the world is Lake Baikal, in Siberia (5,300 ft.). Crater Lake, Oregon, has a depth of 2,000 ft. Of the Great Lakes the deepest is Lake Superior (over 700 ft.), the shallowest Lake Erie (200 ft.).

Lakes are found at every altitude from near the

snowline to below sea level. The highest-lying lake is Titicaca, in South America, whose surface is 12,500 ft. above the sea. The lowest is the Dead Sea, lying 1,290 ft. below the Mediterranean. The waters of lakes are stirred by gentle currents and by waves which in great lakes may rise to heavy surf during storms. The larger lakes are also subject to irregular oscillations called seiches, and the very largest to extremely minute tides.

Among the more important geological functions performed by lakes are the filtering of inflowing river-water, the regulation of the flow of outlet streams with the consequent prevention of floods, and the moderation of extremes of heat and cold in the local climate. Vineyards and peach-orchards flourishing in the great fruit belts of Ontario and Michigan are protected from early and late frosts by tempered lake winds.

As inland waterways of commerce and travel, as reservoirs maintaining a constant supply for irrigation and power projects and city water-service, as important sources of freshwater fish, and as centers of varied summer and winter sports, lakes contribute largely to human welfare. M. B. H.

LAKE CHAMPLAIN, BATTLE OF, Sept. 11, 1814, an engagement of the WAR OF 1812 which resulted in an American naval victory; it was coincident with the BATTLE OF PLATTSBURG. The British squadron under Capt. Downie, consisting of one frigate, the *Confiance,* Downie's flagship; one brig; two sloops and 12 gunboats, engaged the American squadron, consisting of the corvette *Saratoga,* the flagship; one brig; one schooner; one sloop, and 10 gunboats, in Plattsburg Bay. In a sharp, prolonged conflict distinguished by gallantry on both sides, and by Capt. Macdonough's able handling of the *Saratoga,* the *Confiance* was forced to surrender. The schooner *Ticonderoga* meanwhile dispersed all 12 British gunboats. The brig *Linnet* was next to surrender after the *Confiance;* with the two largest ships out of the battle, the rest of the squadron struck colors. While the American vessels were taking off the crews of the sinking *Confiance* and *Linnet,* the gunboats escaped. The American loss was 110; the British, over 200.

LAKE CHARLES, a city in southwest Louisiana, parish seat of Calcasieu parish, situated on Lake Charles and the Calcasieu River. The city is an inland port served by ocean-going steamers, bus lines and three railroads. There is a good land-locked harbor, and a deep channel to the Gulf of Mexico, 35 mi. south. Eleven oil fields surround the city. Calcasieu parish is one of the finest rice-growing districts in the United States. The chief industry is rice milling. Cellulose, fertilizer, oil and lumber products are manufactured. In 1929 the total factory output was approximately $4,000,000; the retail trade amounted to $10,043,425. Lake Charles was founded in 1842 and incorporated in 1867. Pop. 1920, 13,088; 1930,

LAKE DISTRICT, a rugged highland region of northwestern England, situated in Cumberland, Westmoreland and Lancashire counties. The territory, having some sixteen lakes, is bounded on the north by Solway Firth, on the south by Morecambe Bay, on the east by the Eden and Lune valleys below the Pennine Chain and on the west by the low coast bordering the Irish Sea. In the heart of the district are the Cumbrian Mountains; these and the surrounding hill country are intersected by deep valleys; rivers, lakes and cascades combine to form an area celebrated for its varied landscape and romantic beauty. Since the middle of the 18th century men of letters have visited the section and made it their home. Keswick, Ambleside, Rydal Mount, Grasmere and Hawkshead have literary associations with Gray, Wordsworth, Southey, Coleridge, De Quincey, Ruskin and numerous others.

Scafell Pike, 3,197 ft., is England's loftiest mountain. Other high peaks are Skiddaw in the north and Helvollyn in the east. WINDERMERE, 10½ mi. long, but only 1 mi. wide, is the largest lake in all England. Next to it in size is Ullswater; gloomy Ullswater is the deepest, while many consider DERWENTWATER, surrounded by high crags, the most beautiful. Perhaps the most noted of the numerous waterfalls is the cataract of Lodore; others are Dalegarth Force at Eskdale and Scale Force at Crummock. The Derwent, Gretna and Cocker are the most important of the many rivers cutting through the valleys. Keswick, where pencils are manufactured, is the chief town. Other small centers are Ambleside, Windermere, Hawkshead and Bowness. The sparse native population engages in mining and weaving. Good roads lead to all parts of the lake country, though many delightful paths are accessible only to pedestrians. Excellent fishing is afforded by the many lakes and rivers.

LAKE DWELLERS, inhabitants of settlements built for safety in lakes or other bodies of water, on platforms supported by piles or otherwise. Remains of many such dwellings were found in Switzerland when they were exposed by exceptionally low water in 1853-54. They dated from the Stone Age down to the time of the Romans. Some of the relics have been remarkably preserved in beds of peat, or dried-up lakes. Not only implements and bones, fragments of pottery and of wooden housewalls with their plaster lining, but perishable articles like basketry, dyed cloth, with fringes and embroidery, cereals (wheat by the bushel, carbonized), bread, fruit and seeds (50 different kinds at Robenhausen) have been discovered. The Neolithic inhabitants, probably Celtic or Alpine in race, hunted, fished, farmed and traded, and kept several kinds of domestic animals.

Similar habitations occur in all parts of the world, and many are in use to-day.

LAKE ERIE, BATTLE OF, Sept. 10, 1813, a famous naval engagement of the WAR OF 1812. The American fleet on Lake Erie, for the most part constructed at Presqu'Isle (now Erie, Pa.) under the supervision of its commandant, Oliver Hazard Perry, comprised three brigs, five schooners, and one sloop, with a total of 54 guns throwing a broadside of 936

pounds, and was manned by 490 officers and men. The British fleet, as encountered at Put-in-Bay, near the western end of Lake Erie, was inferior, having two ships of war, two brigs, one schooner, and one sloop, with a total of 63 guns throwing a broadside of 459 pounds, and manned by about 460 officers and men. Its commandant was Robert H. Barclay. Perry's flagship, the *Lawrence,* was badly disabled in the early part of the engagement. He removed to the *Niagara,* the American vessels began concerted action, and after a battle of three and a quarter hours Commodore Barclay's flagship, the *Detroit,* and three other British vessels struck colors. The remaining two vessels were overhauled in an attempt to escape. The British casualties numbered 135; the American, 123. The destruction of the British fleet gave the United States control of the upper lakes, compelled the abandonment of Malden and Detroit by the British, and permitted the American army in the West, under Gen. Harrison, to undertake an aggressive campaign.

LAKE FOREST, a residential city in Lake Co., northeastern Illinois, attractively situated on Lake Michigan, 28 mi. north of Chicago. Three railroads serve the city, which is the seat of Lake Forest University, Lake Forest Academy and Ferry Hall. Lake Forest was founded in 1861 and incorporated in 1869. Pop. 1920, 3,657; 1930, 6,554.

LAKE FOREST COLLEGE, at Lake Forest, Ill., a coeducational, privately controlled institution affiliated with the Presbyterian Church. Chartered in 1857 as Lind University, it became Lake Forest University in 1865. In 1876 the institution was reorganized to provide collegiate work. It had productive funds in 1931 amounting to $1,529,253. The library contained 42,000 volumes. In 1931-32 there were 400 students, and a faculty of 32 headed by Pres. Herbert McC. Moore.

LAKE GENEVA, a city in Walworth Co., southeastern Wisconsin. It is situated on a small lake of the same name, 65 mi. northwest of Chicago and is served by the Chicago and North Western Railroad. The city, with its beautiful surroundings, is a popular summer resort. The Yerkes astronomical observatory under the direction of the University of Chicago, is at Williams Bay, 6 mi. west. Pop. 1920, 2,632; 1930,

LAKE GEORGE PARK, a state owned park consisting of 155 islands and islets in Lake George. The 15,378 acres of the park, which was created in 1923 and successively enlarged until 1928, form part of an extensive forest preserve area in the foothills of the Adirondack Mountains. The islands of the park are reached chiefly from Lake George Village on the southern tip of the lake.

LAKE HERRING, a name applied to numerous small fresh-water food fishes of the salmon family, found from the Great Lakes northward and known also as Cisco.

LAKELAND, a city in central Florida, in Polk Co., situated 32 mi. east of Tampa. Fifteen small lakes lie within and around the city. The Atlantic Coast Line Railroad and bus lines afford transportation. There is an airport. Some of the largest and most valuable pebble phosphate deposits in the world are in the vicinity. The region is a rich agricultural country, producing citrus fruits, strawberries and vegetables. Lakeland is a popular winter resort, and has fruit canning and preserving plants. The retail trade in 1929 reached a total of $7,437,045. It is the seat of Southern College. The home for retired members of the United Brotherhood of Carpenters and Joiners of America is located here. Lakeland was founded about 1884 and incorporated in 1885. Pop. 1920, 7,062; 1930, 18,554.

LAKE OF THE WOODS, an irregularly-shaped body of water situated partly in northern Minnesota and partly in southwestern Ontario at an altitude of 979 ft. It has a surface area of 1,485 sq. mi., the southern portion of which is shallow and bordered by low and swampy shores. The remaining coastline is deeply indented with bays and crowned with hills and knobs overgrown with shrubs and evergreens. The northern part of the lake contains many wooded islands. It receives Rainy River from the south and at the north gives origin to Winnipeg River. The city of Kenora is situated near this outlet where the fall of the stream affords abundant water power for lumber and flour mills.

LAKE PLACID, a village of northeastern New York in Essex Co. It is situated about 50 mi. southwest of Plattsburg on Mirror Lake, near the south end of Lake Placid. Two railroads, buses and an airport afford transporation. Two thousand feet above sea level, in the heart of the Adirondack regions, surrounded by Mt. Marcy, Whiteface and other picturesque mountain peaks, Lake Placid is a famous and fashionable resort. International contests in ice-skating, ski-jumping and other winter sports are held annually; Lake Placid was the place of the Third Winter Olympic Games in February, 1932. Stock and dairy farms are operated in the region. Lake Placid was incorporated in 1900. Pop. 1920, 2,099; 1930, 2,930.

LAKE ST. MARY'S PARK, a state park in Mercier and Anglaise counties in western Ohio. St. Mary's Lake was built in 1841 as part of the reservoir system for an extensive system of canals. These canals were abandoned about 1900 and in 1902 an area of approximately 15,500 acres, including the lake and a narrow strip of land along its shore, was converted into a park.

LAKES, SALT. *See* Salt Lakes.

LAKE SCHOOL (Lakers; Lakists), the name originally applied derisively by *The Edinburgh Review* to a group of 19th century English poets, the chief of whom were William Wordsworth, Samuel Taylor Coleridge and Robert Southey, who lived in the Lake region of Cumberland and Westmoreland, and whose poetry, inspired by the natural beauties of the lakes, combined a deep and tender feeling for Nature with simplicity and homeliness. Wordsworth, the essence of whose poetry lies in his ecstatic communion with

Nature, was the foremost of the Lakists; for some 60 years he lived in the region, at Hawkshead, Grasmere and Rydal Mount, and with Grasmere, where he was buried, his name is especially associated. Coleridge, the second in rank, lived for many years at Keswick and Grasmere. Southey, whose reputation has greatly declined, lived at Keswick for 40 years. Many other 19th century writers, either residents of the region or frequent visitors there, were influenced by the Lake spirit, most notably De Quincey who lived at Grasmere, and "Christopher North" at Windermere. *See also* ENGLISH LITERATURE; separate articles on the above authors.

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LAKE TROUT (*Cristivomer namaycush*), a large trout allied to the charrs, called also namaycush, found in lakes from New England and the Great Lakes region to Alaska. It is grayish in color with paler spots on the body and darker markings on the back and tail fins. Although usually of about 15 or 20 lbs. weight, it occasionally reaches 80 lbs. It feeds chiefly on aquatic animals and because of its large size and fighting qualities is a good game fish. Although inferior to the brook trout and whitefish, the lake trout is a fine food fish and commercially is one of the most valuable taken in the Great Lakes. In 1929 the catch of lake trout in United States waters amounted to 11,949,000 lbs., valued at $1,745,000.

LAKEWOOD, a city in Cuyahoga Co., northeastern Ohio. It is a residential suburb of Cleveland situated on Lake Erie and is served by the Nickel Plate Railroad. There is some manufacturing. In 1929 the total factory output was worth about $19,000,000. Lakewood was made a city in 1911. Pop. 1920, 41,732; 1930, 70,509.

LAKE WORTH, a city on the southeastern coast of Florida, in Palm Beach Co., 6 mi. south of Palm Beach. Bus lines and two railroads serve the city. Lake Worth is a residential community and winter resort, located in a farming district. Dairy products, sugar cane and vegetables are the chief crops. The beautiful beach affords bathing, boating and fishing. The city was founded in 1912. Pop. 1920, 1,106; 1930, 5,940.

LAKH, a term used in the East Indies to designate a sum of 100,000 RUPEES, the equivalent of about ten POUNDS STERLING. One hundred lakhs make a crore.

LAKMÉ, an opera in three acts by CLÉMENT PHILIBERT LÉO DELIBES, libretto by Goudinet and Gille; première, Paris, 1883, New York, 1886. It is the most popular of the composer's several operatic works.

Lakmé, daughter of a fanatical Brahmin priest, falls in love with a British army officer named Gerald, who is temporarily stationed in India. The Brahmin, Nilakantha, loathes the Englishman on principle and swears vengeance on him if he establishes that the bamboo fence surrounding his sacred retreat was broken by Gerald. In order to trap the unknown trespasser, Nilakantha and Lakmé go to a public square, and the old man commands his daughter to sing. Gerald falls into the trap and speaks to her, whereupon the Brahmin priest stabs him. Lakmé carries him to a hut in the forest, nursing him tenderly; but military duties call, the lover says he must leave, and Lakmé in despair commits suicide by eating of the poisonous stramonium tree.

LAKMIUT, a North American Indian tribe belonging to the Kalapooian linguistic stock. They lived on the Kalapooia River, a western branch of the Willamette in Oregon, but are now extinct.

LA LAGUNA. *See* CANARY ISLANDS.

LAMAR, LUCIUS QUINTUS CINCINNATUS (1825-93), American legislator, was born in Putnam Co., Ga., on Sept. 1, 1825. He graduated from Emory College in 1845, and was admitted to the Georgia bar in 1847. From 1853-55 he served in the Georgia legislature, and represented Mississippi in Congress, 1857-61. He served during 1861-62 in the Confederate army, resigning to become special commissioner to Russia. However, the Confederate senate refused to confirm his appointment by President Davis. He served in the Senate, 1873-85, where he was very active in trying to establish harmony between the North and the South. He was appointed Secretary of the Interior in 1885. From 1888 until his death on Jan. 23, 1893, he was an associate justice of the Supreme Court, his dissenting opinion in the Neagle Case having become famous.

LAMARCK, JEAN BAPTISTE PIERRE ANTOINE DE MONET (1744-1829), French biologist, was born in Bazantin, Aug. 1, 1744. He was early admitted to the Academy of Jesuits at Amiens but showed greater promise as a naturalist than as a divine. In 1778 appeared his *Flore Francaise*. To him belongs the credit for having first distinguished between the vertebrate and invertebrate types. He published in 1801 his *Systeme des Animaux sans Vertebres* and the following year *Recherches sur l'organization des Corps Vivans*. The *Philosophie Zoölogique* came out in 1809. Between 1815 and 1822 he was at work on his *Histoire naturelle des animaux sans vertebres*. Lamarck emphasized the importance of the use and disuse of parts in the development and decay of the various organs. He accepted the inheritance of acquired characters, a position later discredited by WEISMANN but which is gaining better standing than it once held, although by no means in the crude form in which Lamarck put it forth. He died in Paris, Dec. 18, 1829.

LAMARCKISM, the doctrine that modifications of an animal or plant produced by use or disuse during the life of the organism are transmitted in a greater or less degree to the next generation. The evolution of animals or plants would, according to this view, be directly influenced by the environment, use or disuse and habits. Radium, X-rays, high temperatures and various other external agents have been used to produce changes in the germ cells. Although

this is an environmental effect, it lends no support to the Lamarckian view since the body is not modified first, or at least does not react to the external agent. Lamarckism derives its name from its first exponent, a French naturalist who lived from 1744 to 1829. Although Lamarckism has been embraced and disavowed by many naturalists during the past century none of the many experiments directed towards establishing the validity of the view have yielded convincing evidence in its favor. *See* ORGANIC EVOLUTION.

G. K. N.

LAMARTINE, ALPHONSE MARIE LOUISE DE PRAT DE (1790-1869), French poet, historian and statesman, was born at Mâcon, Oct. 21, 1790. After completing his education he read and traveled widely, and in 1820 published his famous *Méditations, Poétiques et Religieuses,* which obtained an immediate success. Soon afterwards he entered the diplomatic service, and was for a time attached to the French Embassy in Naples. After further travels he returned to France, and was elected to a seat in the Chamber of Deputies, where he speedily gained recognition as an orator. In the meantime he published *Chute d'un Ange, Jocelyn* and *Recueillements.* A combination of political events led him to a foremost place on the political stage, but he held it for only a few months, not being possessed of the qualities that make for high statesmanship. Ousted from political life, he returned to literary work with renewed energy. His *Histoire des Girondins,* remarkable for the beauty of its style, has remained one of the most popular accounts of the French Revolution. When poverty assailed him, the French Government generously voted him the sum of $100,000, in recognition of his outstanding poetical gifts. Lamartine died in Paris, Feb. 28, 1869.

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LAMB, CHARLES (1775-1834), English essayist, was born in London, Feb. 10, 1775, the son of a humble lawyer's clerk. He was educated at Christ's Hospital, and while in this school made a lasting friend in SAMUEL TAYLOR COLERIDGE. At 17 Lamb began his long, wearisome career as an accountant in the East India House, London. In his life there were few events of a startling character. He had numerous friends among the literary men of the day, including Robert Southey, Leigh Hunt and particularly WILLIAM HAZLITT, and at the mid-weekly gatherings of his London friends Lamb became noted as a brilliant conversationalist. There was, however, one calamitous event in 1796 which colored the rest of Lamb's life, and which showed the authentic heroism of his nature. In that year Mary, his sister, succumbed to a fit of insanity and killed their mother by stabbing her to death; with unwavering courage Lamb saved his sister from lifelong confinement, on the promise that he himself would always care for her. His life henceforth was troubled by Mary's periodic fits of insanity. About 1824 Lamb's long service with the East India House was terminated and he was retired on a modest pension. The last years of his life were restless, comparatively unproductive and often lonely. He died at Edmonton, Dec. 27, 1834.

Lamb's early writings include some scattered verse, including *The Old Familiar Faces,* two unremarkable plays, *John Woodvil,* produced about 1802, and *Mr. H—,* 1806, and various contributions to newspapers. With his sister he wrote *Tales Founded on the Plays of Shakespeare,* 1807, which has introduced many a child to Shakespeare. Lamb was particularly interested in the ELIZABETHAN ERA, and in 1808 he gained some reputation as a critic with his *Specimens of English Dramatic Poets who lived about the time of Shakespeare.* In 1820 he began to contribute to the *London Magazine* those essays which were to become famous as *The Essays of Elia,* published in book form in 1823. In the essay Lamb found his true medium, and into this form he distilled all the elusive charm, humor, whimsicality, the odd knowledge of books and life, and all the personal sweetness and light which make him one of the best loved of English writers. He dealt in the common aspects and events of life, but in a style which makes the *Essays* unique. His tone varied from the humor of the essay *On Roast Pig* to the pathos of *The Dream Children.* His style had the subtlety, gentleness, the grace of wit and phrase of the 17th century prose masters. Lamb set the supreme standard in English literature for the personal, intimate essay. *See also* ENGLISH LITERATURE.

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LAMB, sheep less than one year old. "Hothouse lambs" are born in the late fall or early winter and marketed in late December. They are younger and smaller than "spring lambs" which are marketed from early spring to fall. There are six cuts in a side of lamb: the neck, chuck, shoulder, loin, flank and leg. Chops are cut or "chopped" from the loin, rib, chuck or shoulder into pieces suitable for broiling or frying.

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LAMBERT, ANNE THÉRÈSE DE MARGUENAT DE COURCELLES, MARQUISE DE (1647-1733) French author, was born in Paris in 1647. She married the Marquis de Lambert, and after 20 years of marriage was left a widow with two children. Settling in Paris, she formed a salon noted for its austerity. She was the author of *Avis à sa fille* and *Avis d'une mère à son fils,* both of which were printed without her knowledge. She died on July 12, 1733.

LAMBETH PALACE, the residence of the Archbishop of Canterbury in the London suburb of Lambeth, Surrey, England. Built on grounds owned by the see of Canterbury since about 1190, the palace is constructed of gray stone and red brick and represents many different periods of architecture. The crypt, dating from the late 12th century, is beneath the 13th century chapel and constitutes the oldest portion of the building. "Lollard's Tower," 1435, was used

as a prison in the 15th-17th centuries, and here the Earl of Essex, Richard Lovelace and others were confined. Morton's Tower, built 1490, the 16th century Cranmer's Tower and Laud's Tower, 1635, are interesting architecturally. The Great Hall contains a valuable library, and the former Guard Room houses a notable collection of paintings. The residential portion was built by Edward Blore in 1833.

LAMBKILL (*Kalmia angustifolia*), a small evergreen shrub of the heath family called also sheep laurel and wicky. It is found in swamps and moist soils in northeastern North America. The shrub grows about 3 ft. high bearing nearly erect branches, smooth oblong leaves and numerous crimson or purple flowers in showy clusters. Several varieties including dwarf and white-flowered forms are in cultivation. The leaves, like those of the MOUNTAIN LAUREL, are poisonous.

LAMB'S LETTUCE, a name sometimes applied to the CORN-SALAD, a smooth, low herb common in European grain fields, varieties of which are grown in vegetable gardens.

LAMB'S QUARTERS, a name often applied to the common GOOSEFOOT or pigweed (*Chenopodium album*), native to Europe and Asia and widespread throughout the world as a field and wayside weed. *See* CHENOPODIUM.

LAMBTON, JOHN GEORGE (1792-1840), First Earl of Durham, English statesman. Born at London, Apr. 12, 1792, he was educated at Eton and later held a commission in the army. In 1813 he was elected to the House of Commons and at once became a staunch advocate of reform. This brought him in close contact with Earl Grey whose daughter he married in 1816. In 1830 he was appointed lord privy seal and, as chairman of a cabinet commission for the reform bill, he practically drafted the great reform bill of 1832. After a special mission to Russia he was created first Earl of Durham and Viscount Lambton in 1833. Between 1832 and 1837 he was at different times ambassador to St. Petersburg, Vienna and Berlin.

His extraordinary services, however, came in connection with Canada where he was sent as governor in 1838 soon after the rebellions by Papineau and Mackenzie. Although he remained in the colony less than a year, he obtained a very clear insight into its problems and his remarkable report on conditions in Canada, and the line of policy that should be pursued, has won for him a foremost place among British Empire builders. Confident that a federation of the different areas of Canada would be the ultimate line of development, he urged the union of Upper and Lower Canada, an executive council responsible to the legislature, the building of an intercolonial railway and a thoroughgoing program for emigration to Canada from the mother country. Indignant at the failure of the government to support his policy, and in failing health, he resigned in 1838. He died on July 28, 1840, at Cowes, Isle of Wight.

LAMECH, mentioned by both the antediluvian traditions in the BOOK OF GENESIS, as the son of Methusael and also of METHUSALEH, and the father of Tubal-cain. His significance lies chiefly in three things: he was the first polygamist in the Bible; he was "the barbaric eulogist of blood revenge," and his "sword lay," as his song is called, may be "the oldest extant Hebrew poetry." Scholars differ as to his historical character, and many hold that he personifies an early important clan.

LAMENTATIONS, BOOK OF, which follows the BOOK OF JEREMIAH in the Old Testament, was commonly ascribed to him; but the words "of Jeremiah" are no part of the Hebrew title. The authorship and date of the book are unknown. Many modern scholars find internal evidence that it is the work of two, if not three, authors, and place its date somewhere between 581 and 516 B.C. The book consists of five dirges in as many chapters, dealing with the sufferings of Judah and Jerusalem during the siege and after the capture of the city, 586 B.C. Its condemnation of the sins of the people, its exhortations to repentance, and its prayers for God's favor bring assurances that "the Lord will not cast off for ever, for though he cause grief, yet will he have compassion, according to the multitude of his mercies."

LAMINATED WOOD. *See* PLYWOOD.

LAMMERGEIER (*Gypaëtus barbatus*), called also bearded vulture, a very large bird of prey allied both to the vultures and the eagles, inhabiting mountainous regions in Europe and Asia. It is about 3½ ft. long with a wingspread of 9 or 10 feet; its plumage is grayish black above, tawny below, with white feathers on the head and a tuft of bristly feathers on the chin. The lammergeier subsists chiefly on carrion but also preys upon various small animals.

LAMONT, THOMAS WILLIAM (1870-), American banker and economist, was born at Claverack, N.Y., Sept. 30, 1870. He was educated at Phillips Academy and Harvard. In 1893 he became a reporter on the New York *Tribune*. The following year he obtained a bank position, and was rapidly promoted. He was vice-president of the Bankers Trust Co., New York, in 1905-09. In 1911 he was made a member of J. P. Morgan & Co. Lamont became widely known for his work as U.S. Treasury representative on the American Commission to Negotiate Peace (Paris 1919), as chairman of the American Group of the International Consortium for the Assistance of China (1920), and for his success in floating Allied loans in the United States. He visited China in 1920 and 1927.

LAMP. *See* LAMPS; ILLUMINATION, ARTIFICIAL; LAMP SHADES.

LAMPBLACK, a PIGMENT made from smoke resulting from the imperfect combustion of hydrocarbon oil or distillates; and sometimes from the smoke of resinous woods, tar and pitch. It is liberally mixed with oils, and is generally used alone. It is made by placing in the flame of the substances mentioned above a piece of cold porcelain or similar material, which prevents perfect combustion. Carbon deposits on the cold substance in the form of lampblack.

LAMPONG, also Lampongs, a residency on the southeastern coast of SUMATRA, in the Dutch East Indies. It comprises an area of 10,914 sq. mi., mostly mountainous, some of the peaks rising to elevations of 7,000 ft. Chief among the several important rivers that traverse the province are the Sekamung, the Terrusan and the Seputi. Black pepper, rice, tobacco, rubber and coconuts are the chief products. Teluk Betong is the capital. Pop. 1927, 258,891.

LAMPOON, a piece of humorous abuse in verse or prose, aimed directly at a person's character, habits or actions. The term is probably derived from the French *lampons,* "let us drink," and originall, meant a drinking song. It was very popular in 17th century England, particularly during the Restoration, when lampoons were pasted up in public places and coffee houses, and acknowledged perhaps its supreme master in Tom Brown, the famous wit (d. 1704).

LAMPREYS, a group (*Hyperoartia*) of eel-like aquatic animals, allied to the hagfishes, widely distributed in temperate regions in both fresh and salt water. From the true fishes lampreys differ in having no bony skeleton, paired fins or jaws. Their long slender bodies, covered with smooth naked skin, contain in the place of a vertebral column or backbone only a thick notochord surrounded by membranes. Lampreys have well-developed eyes, a single imperforate nostril, and seven nearly circular gill-openings in a row on each side. The large, round, sucking mouth is armed with numerous conical rasplike teeth. The larger species feed upon the flesh and blood of fishes, destroying many of economic importance. Lampreys lay numerous small eggs usually in brooklets away from the sea, the marine species ascending the rivers to spawn; the adults generally die soon after spawning. Representative North American species are the great sea lamprey (*Petromyzon marinus*), often 3 ft. long, of the North Atlantic coast, of some value for food; the brook lamprey (*Lethenteron appendix*), found in ponds and lakes from New York to Iowa southward to Virginia, and the western lamprey (*Entosphenus tridentatus*), of the Pacific coast. *See also* HAGFISH.

LAMPS, devices for producing artificial light. There are three general classes, oil, gas and electric.

Oil lamps, used from the dawn of history, were gradually supplanted by gas lamps, beginning early in the 19th century, and they, in turn, were gradually replaced by electric lamps during the latter part of the 19th century. The majority of oil or gas lamps which have survived are those used for purposes for which they are peculiarly adapted. *See also* GAS LAMPS; INCANDESCENT LAMPS; GASEOUS-CONDUCTOR LAMPS; HEADLIGHTS; ELECTRIC LAMPS; ARC LAMPS; OIL LAMPS; SAFETY LAMPS. H. S. B.

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LAMP SHADES, lighting appliances used to keep artificial light from spreading in all directions. When properly shaped and when the side towards the lamp is light in color, shades also direct light rays and serve as REFLECTORS. Shades are made of silk, parchment, glass and various other materials, usually attractively ornamented.

LANARK, a royal burgh and county town of Lanarkshire, Scotland, lying 31 mi. southeast of Glasgow on the Clyde. The scene of a parliament in 978, it is an ancient seat of Scottish kings. In a cave



COURTESY WESTINGHOUSE LIGHTING INST.

EARLY TYPES OF LAMPS

Showing a torch, stone lamp, pottery lamp, bronze lamp, Flemish oil lamp, candle and coal oil lamp

of the region Wallace hid after killing the English sheriff of Lanark. A mile south is New Lanark, noted for Robert Owen and his theories of socialism. Largely industrialized, the town has little to recall its antiquity. Sir Richard Arkwright, inventor of the spinning frame, established the spinning mills that still prosper. Lanark makes hosiery and leather and holds live stock markets. Pop. 1921, 6,268; 1931, 6,178.

LANCASTER, JOSEPH (1778-1838), English educator, was born in London, Nov. 25, 1778. While working as a seaman when a youth he became concerned with the limited educational opportunities of the poor and began teaching without any special training. When only 20 years old he had over 1,000 pupils and was able to get financial aid to establish regular schools. These were organized to accommodate a large number of pupils at a low rate of tuition; but, having few teachers, he inaugurated the system whereby advanced pupils instructed the beginning classes. This LANCASTERIAN METHOD of education was later used in Europe and America. Lancaster died in New York, Oct. 24, 1838.

LANCASTER, a river port and the county town of Lancashire, England, lying at the head of the estuary of the River Lune, 7 mi. from the sea and 230 mi. northwest of London. Traces of Roman and Anglo-Saxon occupation attest its early importance. The castle, built after the Conquest upon Saxon foundations and on the site of a Roman camp, was later strengthened and restored by John o' Gaunt after being badly damaged by the Scots in 1322. The Church of St. Mary, also upon the crown of the slope and originally attached to an 11th century Benedictine monastery, is largely Early English and Perpendicular in style, and is distinguished for its rare carved-oak and

canopied stalls. Modern Lancaster is given over to industry, including linoleum manufacture, railway wagon works, engineering, cotton spinning and cabinet making. Five miles down the Lune is a dry-dock accessible to moderate-sized vessels. Pop. 1921, 40,212; 1931, 43,396.

LANCASTER, a village in Erie Co., western New York, situated 10 mi. east of Buffalo. It is served by four railroads. There is diversified farming and stock raising throughout the region. The local manufactures include locomotives and glass and iron products. Pop. 1920, 6,059; 1930, 7,040.

LANCASTER, a city of south central Ohio and the county seat of Fairfield Co., located on the Hocking River, 32 mi. southeast of Columbus. Intersected by the Hocking Valley and the Pennsylvania railroads and situated in a fertile farming country having natural resources of gas, fire clay, building stone and glass sand, and adjacent to productive coal and oil fields, Lancaster is an important trading center. Its industries, with an output valued approximately at $15,000,000 in 1929, include railroad and machine shops, shoe factories and glass works. The retail trade during 1929 amounted to $10,194,918. Within the city, Mt. Pleasant, 200 ft. high, is rich in Indian lore. Nearby points of interest are Buckeye Lake, between Lancaster and Newark, and the Boys' Industrial School, the state farm to the south. Gen. William T. Sherman and U.S. Senator John Sherman (1823-1900), author of the Sherman Antitrust Law, were born in Lancaster. It was settled in 1800 and chartered as a city in 1851. Pop. 1920, 14,706; 1930, 18,716.

LANCASTER, city and county seat of Lancaster Co., Pennsylvania, 36 mi. southeast of Harrisburg on the Conestoga River; it is served by the Pennsylvania and the Reading railways, motor bus and electric lines and an airport. Lancaster has valuable farm and livestock products, and is one of the largest cattle markets east of Chicago. The Susquehanna, at Holtwood, 25 mi. away, supplies hydroelectric power. In 1929 the value of manufactures, chiefly linoleum, watches, metal products, umbrellas, silk and cotton goods, was approximately $94,000,000; the retail trade amounted to $40,139,822. There are several church colleges; 57 churches representing 20 denominations; a trade school founded through bequest of Thaddeus Stevens, former resident; a school for girls, established by early Moravian settlers near by; many historic buildings and near by, joining Lancaster and York counties, is the new Columbia Bridge. Notable names associated with Lancaster's vicinity are President Buchanan, Benjamin West, Robert Fulton, Lindley Murray, Thomas Cookson, Lloyd Mifflin, Thomas W. Evans, George Ross, Barbara Frietchie, Gen. Edward Hand of the Revolutionary War and Gen. John F. Reynolds of the Civil War.

German Mennonites arrived first in Lancaster in 1710, and members of other religious sects arrived soon after. Lancaster, formerly called Hickory Town, was named by John Wright in 1729 for Lancaster, England. It became a borough in 1742, a city in 1818 and adopted a commission government in 1926. Pop. 1920, 53,150; 1930, 59,949; 2% are foreign-born.

LANCASTER, HOUSE OF, a royal British family. The royal line descends from John of Gaunt, Duke of Lancaster (1340-99), fourth son of Edward III; but the title was used earlier in 1267, when it was given by Henry III to his second son, Edmund. The house maintained the throne for three generations, beginning with Henry IV (1399-1413) who seized the throne in 1399. He was succeeded by his son, Henry V (1413-1422), who was in turn followed by his son, Henry VI (1422-71). The rival claims of the HOUSE OF YORK which culminated in the WAR OF THE ROSES, 1455-86, were based on the line established by Lionel, Duke of Clarence, an older brother of the Lancastrian John of Gaunt. The houses were united by the marriage of Henry VII, grandson of John of Gaunt, to Elizabeth, heiress of Edward IV, in 1486.

LANCASTER HOUSE, a mansion at the southeastern corner of the Green Park, London, England, noted as the home of the London Museum. It was formerly known as Stafford House.

LANCASTERIAN MOVEMENT, a system of instruction founded by Joseph Lancaster in the late 18th century and similar to the MONITORIAL SYSTEM. The students of the upper grades were used as instructors of the pupils in the lower classes. After a lecture tour by Lancaster in America, his system was tried out first in New York City and then adopted throughout the country. It was used with modifications in elementary schools for about 50 years.

See J. F. Reigart, *Lancasterian System of Instruction in the Schools of New York City*, 1916.

LANCE, a well-balanced long shaft with an iron or steel point, used by special mounted troops, called lancers, for the attack against personnel in battle. The use of this arm is decreasing rapidly on account of the devastating effect of MACHINE GUN fire against men and animals in open combat.

LANCELET, the common name for a small family (*Branchiostomidae*) of wormlike marine animals, known also as amphioxus, comprising the lowest order (*Leptocardii*) of vertebrates. They live in sand and shallow water along seacoasts widely throughout the world. Their slender, translucent, lancet-shaped bodies, sometimes 2 in. long, contain a notochord but no true skeleton, brain, heart, colored blood or eyes. Lancelets feed upon minute plants and animals drawn into the mouth by a current of water which passes out through the gill openings. The Virginia lancelet (*Branchiostoma virginiae*) occurs from Chesapeake Bay to Florida; the California lancelet (*B. californiense*) is found from San Diego Bay southward.

LANCHOW, provincial capital of Kansu, China, on the Hwang Ho River, which was crossed, until recently, by the "bridge of boats," over 600 ft. in length, and famed throughout China. It was replaced in 1909 by an American steel bridge. The chief industries are now connected with the tobacco and fur brought from the west; coarse cloths and

woolen goods are manufactured. Pop. est. 1923, 368,608.

LANCIANI, RODOLFO AMEDEO (1846-1929), Italian archaeologist, born in Rome, Jan. 1, 1846. He was educated at the University of Rome where, in 1878, he became professor of Roman topography and engaged in extensive investigations of Roman ruins. Among his many important discoveries are the House of the Vestals, the Basilica, the Palatine Palace and Hadrian's Villa. He published *Ancient Rome in the Light of Recent Discoveries,* a group of lectures given at Harvard in 1887; *Pagan and Christian Rome; Ruins and Excavations of Ancient Rome;* and *New Tales of Old Rome.* He died in Rome, May 22, 1929.

LAND, in economics, one of the four factors of production conventionally recognized, the others being LABOR, CAPITAL and management. Land occupies the prominent place it does in economic life and in the science of economics, partly because it is in last analysis the source of nearly all the raw materials from which are fashioned the WEALTH which supports human life and culture, and partly because land ownership has a profound influence on the distribution of INCOME.

It is difficult rigidly to define land. It is probably best to define it pragmatically, for the purposes of a given discussion. DAVID RICARDO, confronted with the practical problem of agricultural depression and agitation for a protective tariff on grain, and seeking to prove to the English landlords that they could not reasonably claim the right perpetually to rents high enough to pay the current rate of interest on land values inflated by war prices, evolved his famous theory of the "original and indestructible powers of the soil." The only indestructible feature of land, however, is its areal extension. Fertility can be exhausted by destructive cropping and subsurface resources are inevitably exhausted by continued mining. In the attractive industries, especially agriculture, physical properties of the land are as important as areal extension and situation. In other uses situation is the important matter. Economists commonly lump all natural resources in the general category land, but some classify raw materials separately. For certain purposes this should be done.

Whether land should be classed as a distinct factor or as capital has been a moot question, but it is an indisputable fact that the amount of land in existence is practically a fixed quantity, independent of any human motive, while capital can be increased or decreased practically at will. This gives valid ground for refusing to identify rent and interest, as some economists have attempted to do. Land in the natural state has no COST OF PRODUCTION, while the production of capital instruments, generally speaking, involves not only the expenditure of labor but, directly or indirectly, saving, which is essentially a curtailment of current consumption. It is true that the improvement of land involves a cost, and for practical purposes it is impossible sharply to separate land from the improvements on it. Nevertheless a distinction is commonly made in law, and for taxation purposes. The fixed quantity of land, especially of superior quality or favorable location, gives to land ownership a semi-monopoly character. Increased land values are in part the result of population growth and increasing demand for a thing the supply of which cannot be increased. This fact is the basis of the well-known proposal for the social appropriation of the unearned increment.

It is obvious that the fixity of the land area of the earth, only part of which can be used for agricultural purposes, is a fact of fundamental importance to the problem of the future population and the standard of living. In the future much more attention will be given to land economics. A. B. W.

LAND CLEARING, the removal and disposition of trees, brush, stumps and stones, generally from land which is to be cultivated. Trees are usually removed by cutting and felling, the wood being hauled away or piled and burned. A tree may be killed by deadening, i.e., cutting a deep, continuous ring around the trunk and leaving it to die and decay from six to eight years so that it can be removed easily. Poison may be placed in the girdling ring to hasten the process. A poison which is effective with most species of trees is composed of one lb. white arsenic, two lbs. lye and two gals. water. Most trees, when so poisoned, will be decayed so that they can be easily removed within two years.

Brush may be disposed of by cutting, piling and burning, by heavy continued grazing by goats or sheep, by broadcast burning or by plowing. Of these methods, cutting, piling and burning is the one generally employed. Probably less sprouting from the stubs of the brush will occur if the brush is cut during the late summer months. Grazing with goats, which are preferred to sheep, requires heavy fencing, and it takes some time to kill the brush completely. Broadcast burning can be done only at certain seasons of the year when brush and ground is dry, and permits must be obtained from local authorities in most states before such burning may be done. To secure the best results from broadcast burning, the ground should be put into cultivation immediately after the fire. Brush not over six ft. high may be plowed under, but when the brush is tall and thick the ground is not left in good shape for cultivation and should be kept in grass or hay for a period of three or four years.

Unless there is immediate need for the land, stumps should be left to decay for several years after the trees are cut. Stumps can be removed with the grubbing hoe, by the direct pull of horses or tractor, by burning in place or by blasting.

Digging out stumps by hand is laborious work, but, where labor is plentiful and cheap, it is an efficient method. It has an advantage over some other methods in that all of the main roots are removed. Mechanical pullers vary from crude, home-made levers to heavy machines for large scale operations. The

horse-operated puller consists of a vertical drum which is turned by one or two horses hitched to the end of a sweep to wind up a cable attached to the stump; it is the most widely used mechanical device. Pullers operated by manpower, by tractors or gasoline engines are also in common use. Stumps are destroyed in place by both open and controlled fires. The open fire is built at the base of the stump and led into its middle by auger holes. The fire may be confined, after it has been well started, by piling clay around it. Fans, driven by gas or electric power, are used to create a draft and to direct the heat downward toward the roots. Fire is used most effectively on large stumps and can be used only when stump and ground are dry; great care must be taken to insure the destruction of the roots. Explosives are widely used for blasting stumps out of the ground, for loosening large stumps before pulling and for splitting large stumps which have been pulled. This method is adaptable to a large variety of conditions and requires little labor or equipment. When stumps are to be burned in a pile, they should be cleaned of earth and placed in a high, narrow, and compact heap.

Stones are removed by loading them upon sleds or low wagons and hauling them from the field. Explosives are used for blasting buried stones from the ground and for breaking large ones so that they can be handled. G. R. B.

LAND DRAINAGE. *See* DRAINAGE OF LAND.

LAND ECONOMICS. *See* AGRICULTURAL ECONOMICS.

LANDER, a city in western Wyoming, the county seat of Fremont Co., situated on the Popo Aggie River about 100 mi. northwest of Rawlins. The city lies at the foot of the Rocky Mountains in a farming and lumbering region. Lander is in the vicinity of extensive oil fields and coal mines and has an abundance of water power which made it an electrically-equipped city before the Chicago and Northwestern Railroad reached it. Lander has flour mills and a creamery. A short distance northwest is the Shoshone Indian Reservation. Wind River Peak, 13,500 ft., is about 20 mi. southwest. Pop. 1920, 2,133; 1930, 1,826.

LAND GRANT COLLEGES were established in the United States as a result of appropriations from the Federal Government in accordance with the Morrill Act of 1862. Each state was given 30,000 acres of land for each senator and representative then in Congress for the endowment and maintenance of a college primarily devoted to teaching agriculture and the mechanic arts. Further aid has been given by the Federal Government through other Acts.

See United States Bureau of Education *Bulletin*, 1927, No. 37.

LAND GRANTS, EDUCATIONAL, grants of land by the United States Government to states for public schools or colleges. The first land grant was made in 1787 by Continental Congress as a result of agitation in the Ohio country for land for schools and churches. Following this, each public land state was given a section of land (after 1850 two sections) for endowing schools. In 1862 the Morrill Act gave additional land to each state for LAND GRANT COLLEGES.

See F. H. Swift, *History of Public Permanent Common School Funds in the United States*, 1911.

LANDLORD AND TENANT. This subject will be considered from four major angles: 1. Types of tenancies; 2. The tenant as distinguished from a "cropper" and from a licensee; 3. The LEASE including the collateral covenants; 4. The termination of the relationship.

1. **Types of Tenancies** are commonly: *a.* tenancies for a term; *b.* tenancies from year to year; *c.* tenancies at will; *d.* tenancies at sufferance.

a. Tenancy for a term is one where the continuance of the relation is fixed and certain, and is made by the agreement of the parties.

b. A periodic tenancy endures for a certain period, but if notice by the tenant that he intends to surrender the premises, or by the landlord that he intends to re-occupy them, is not given, the tenancy renews itself until the suitable notice is given. If the period was originally less than a year, or for a year, or more, the new tenancy is for one year. It usually begins with a fixed term and thereafter the tenant holds over with the assent of the landlord. If the tenancy is from year to year, six months notice before the end of the year is required in order to terminate the tenancy; if the period is a shorter one, the notice should be given at the beginning of the period. The matter is frequently regulated by statute.

c. Tenancy at will may be created by LEASE or by "permissive possession." It may be terminated at the will of either parties without notice and is terminated by the death of either, by a transfer of the landlord's reversion, by entry against the tenant, and by notice.

d. Tenancy at sufferance arises where a tenant holds over after the end of a lawful term, without the consent of the landlord, or where a tenant at will holds over after the tenancy is terminated, or where a life tenant conveys the premises or leases them to one who holds over after the leasor's death.

2. **The Tenant.** A periodic tenant as distinguished from both a cropper and a licensee, implies an interest in the land. Originally a tenant could recover damages only from a landlord who had dispossessed him, and nothing from a third person who may have done so. Later English statutes not only gave the tenant an action for damages against such third persons, but he was enabled to recover the land itself from either the landlord or a third person. The distinguishing characteristic, then, is that the tenant has not only a contract right to the land, but an estate in it. He is the owner of the land for the time.

On the other hand, a "cropper" has an interest in the crops raised only, and has no interest in the land. A cropper is one who arranges with the owner to plant and cultivate the land, and agrees that the crops raised shall be shared in certain proportions.

A *licensee* likewise has no possession of the premises. A lodger is an illustration of the licensee. He has permission to use a room, but does not have

a tenant's possession. He cannot bring an action of ejectment against an intruder, or sue him for TRESPASS. So also a servant furnished with quarters, a contractor on the owner's land to erect a building for the latter, an advertiser using fence or the walls of a structure, is merely a licensee. However, the owner should not interfere with the reasonable use of the licensee.

3. **A Lease,** normally determines the relationship of landlord and tenant. A lease must be in writing to be valid, if the tenancy embraces a considerable period of time. In many states a lease for a year may be oral but not for a longer time.

The conventional lease contains various covenants. The more important covenants of the tenant are to pay the agreed rent, to make ordinary repairs, not to sublet or assign without consent of the owner, and sometimes to keep the premises insured and to pay the taxes. *See* TAXATION.

The owner is not obliged to make any repairs unless he has specifically covenanted to do so. But the tenant is obliged to pay rent and continues responsible, even though the premises may be untenantable. That a house is so infested with vermin as to be untenantable is not regarded as excusing him from liability, but the rule is otherwise where the premises is a furnished house. If the landlord has agreed to make repairs and fails to do so, failure is sometimes held to be a constructive eviction of the tenant. Where the tenant is evicted from a portion or from the whole of the premises, the duty to pay rent discontinues.

It is to be further observed that the tenant is not liable for accidental injury to the premises arising from unpreventable accidents; but he is liable for the wrongful acts of third persons though they may have been committed against his will. Thus, where a tenant published an abolitionist paper on premises located where there was strong slavery sentiment, the tenant was liable for injuries to the premises caused by the acts of such sympathizers. A tenant is also liable for failing to make ordinary repairs.

4. **Termination of the Relationship** may raise difficulties, which require discussion of what is technically called a "surrender." A surrender denotes the giving up of a lease by one who has the premises in possession. It may arise by express agreement or by operation of law. If the parties have created a situation inconsistent with the continuation of the lease, they are not permitted to assert that it continues. A surrender by operation of law arises. Thus, if the tenant agrees that a new tenant may take possession and the latter does so under a new lease; or if the tenant accepts a new lease which begins before the former term expires; or if the tenant sublets and the landlord, with tenant's consent, makes a new lease to the sublessee; or if the tenant gives up possession and the landlord resumes possession with intent to terminate the lease, there is a surrender which the courts will enforce. *See also* FIXTURES; LEASE. A. E. E.

LAND NATIONALIZATION, a movement based upon ethical and economic considerations which aims at the abolition of private property in land, to be achieved either by gradual state encroachment through taxation or by confiscation. LAND is defined as including all natural agents—embracing forests, mines, oil deposits, waterways and harbors as well as city lots and agricultural land. First enunciated in antiquity, the movement has at many periods attracted the attention of social reformers. Its most forceful sponsor in recent times was Henry George who through his brilliant work, *Progress and Poverty,* secured a widespread acceptance of the single tax. This tax absorbing land rent will, it is held, give free access to the soil, stimulate production, relieve the crushing burden of taxation upon the capitalist and the worker, and emancipate mankind from the land owner. The theory is based upon the doctrine of natural rights; it being maintained that land is a social heritage which cannot be alienated by society. Following David Ricardo's law of rent, the landlord is held to be the recipient of the benefits of social progress through the receipt of the unearned increment in the form of increasing land values and rents. Soviet Russia has, through governmental decrees, effected the most widespread experiment in land nationalization yet attempted. There, however, the land nationalization is part of a general socialist program—a result not sought by the Georgists. Socialists and Communists incorporate land nationalization as a basic plank in their platform, arguing that it is but one method by which exploitation takes place.

Opponents of land nationalization point to the injustice of confiscating savings invested in land, to the difficulty of enforcement and to the service of the landlord in holding land to ripen into value. They deny that increased production would follow the adoption of land naturalization and point to the importance of private property in the social fabric.

C. E. W.

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LAND OF NOD, the land of sleep or dreams. Hence, to go to the Land of Nod means to go to sleep. As the expression appears in Genesis 4:16, "Cain went . . . and dwelt in the land of Nod," it perhaps means also the Land of Wandering.

LANDOR, ARNOLD HENRY SAVAGE (1865-1924), English traveler and grandson of Walter Savage Landor, was born in Florence, Italy, in 1865. He traveled in Africa, South America, the Philippines, India, China and Tibet. He established the exact location of both sources of the Brahmaputra River in Tibet in 1897. He was the first white man to explore portions of the interior of the island of Mindanao, where he discovered the so-called "White Tribe," the Mansakas. He was the first Anglo-Saxon to enter the "Forbidden City" of Peking (1900) and at one time held the world altitude record in mountain climbing. He disputed the existence of the River of Doubt with Theodore Roosevelt. He is the author of *In the Forbidden Land* (1898), *Across*

Wildest Africa (1908), *Mysterious South America* (1914). He died in Florence, Italy, Dec. 27, 1924.

LANDOR, WALTER SAVAGE (1775-1864), English author, was born in Warwick, Jan. 30, 1775. He was educated at Rugby and at Trinity College, Oxford, but was rusticated from the school and expelled from Oxford for an unruly prank, and did not return. His love of roving caused him to move from place to place in England, France and Italy. Landor's writing career extended over almost 70 years, his first book appearing in 1795 and his last in 1863. He is perhaps best known by *Imaginary Conversations,* several series of dialogues published at intervals during the 30 years after 1824; *Pericles and Aspasia,* by many critics considered his best work; and the *Pentameron.* Landor's poetical works, written in English, Latin and Italian, were highly praised. His prose works were graceful, polished and classical in spirit. He died in Florence, Italy, Sept. 17, 1864.

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LAND O' THE LEAL, a Scotticism meaning Land of the Faithful, an imaginary land of happiness. In a song of the same name by Lady Nairne (Caroline Oliphant, 1766-1845), the expression means Heaven.

LAND RECLAMATION, the regaining for agriculture or other purposes of arid, marshy, submerged, or other waste lands by IRRIGATION, DRAINAGE, filling, or grading. Reclamation by filling may be accomplished with the wastes of communities, such as ashes, refuse, and cinders; spoil from excavation, demolition, construction, and mining; and industrial wastes; or in combination with waterway improvements by depositing dredging spoil as fill (*see* DREDGING). Drainage, sanitary measures, protection from erosion, provision or conservation of top soil, may be important factors on lands that have been newly reclaimed by filling.

Where irrigation or drainage is required, the usual procedure is to organize an irrigation or drainage district under the laws of the state in which the lands are located. Surveys are then made, plans for reclamation prepared, arrangements made for funds, usually by the sale of the bonds of the district, and contracts for construction secured. After the necessary works are built, the lands are brought under cultivation. The difficulty of securing enough farmers to bring the reclaimed land into cultivation quickly has involved many such districts in serious financial difficulties. Reclamation projects should not be undertaken until a comprehensive engineering economic survey has been made of the district to determine the probable cost and the return that may be expected over a period of years. The Federal Government through the Bureau of Reclamation, Department of the Interior, constructed a number of irrigation projects to reclaim arid lands. *See also* LAND CLEARING; IRRIGATION; DRAINAGE OF LAND; DRAINAGE DISTRICTS.

LANDRY'S PARALYSIS. *See* PARALYSIS.

LANDSBERG (on-the-Warthe), a German city in the province of Brandenburg, located on the Warthe River, about 40 mi. northeast of Frankfurt-an-der-Oder. It has machine and boiler factories, jute spinning and weaving mills, sack factories and numerous smaller industries. There is considerable river shipping, principally in livestock, grain and timber. Landsberg has a Gothic church of the 15th century. It was granted municipal rights by John I, margrave of Brandenburg, in 1257. Pop. 1925, 43,303.

LANDSCAPE GARDENING and kindred subjects such as landscape architecture, landscape engineering, and landscape design, apply to the pleasing arrangement of plants, walks, drives, buildings, rocks, water and other materials in relation to each other and their surroundings.

Objections to these terms are that the first seems not to include the underlying principles of design; the second apparently forgets garden materials; the third seems more concerned with roads, drainage and other surveyors' problems; and the last is vague. Other objections are that these terms are so cumbersome that their resonance suggests baronial manors, landed estates, vast parks and villas, thus excluding village and similar home grounds, which have equal right to be included; for good taste applies to these as well as to more extensive areas.

In Great Britain the simple term "gardening" has long been in popular use, especially for the natural method of arrangement, but since in America this word also includes vegetable and flower growing it fails to meet the need of them all. The one best understood and in most popular use is landscape gardening.

The most ancient instance of this art of which we have record is the hanging garden which Nebuchadnezzar constructed for his Median queen who in the flat land of Babylon missed the mountain scenery of her native home. The garden consisted of a terraced pyramid elevated on pillars and planted with trees, shrubs and flowers, which were irrigated by a force of men constantly pumping water from the Euphrates.

Although other gardens existed in ancient times we know little of the styles in vogue in the various nations. During the days of the Romans, geometric forms became popular as evidenced by still existing villas. Historical data also prove that Roman gardens were laid out in straight avenues and rectangular figures.

Up to the 13th century of the Christian Era the gardens were mostly small walled enclosures connected with monasteries, convents and castles. From that period forward for several hundred years the nobility of Italy particularly, and, still later the popes, established splendid parks around their villas, the best known of these still existing at Versailles. Laid out by the celebrated landscape gardener La Notre for Louis XIV, it has undergone various changes in the interim, but in general maintains most of the stiff lines and artificialities which characterize the designs of that period.

To designs of this type the term landscape archi-

tecture was originally applied and still is so used in France. In them the land is compelled to fit the plans, whereas in informal designs the land decides what the plans shall be. In America the term was first employed by the Central Park Commission in 1862 by Olmsted and Vaux, who laid out the park. Afterward it was retained by Olmsted and adopted by many other practitioners since, in spite of the fact that most American landscape gardening is informal.

Formal gardens often impress by their pleasing proportions, accuracy of scale, minute detail or appropriateness to their surroundings; but they lack the restfulness, beauty, continuous enjoyment, pleasing variety and picturesqueness which characterize the naturalistic style of design.

Of much more recent development is the naturalistic style of planting which is often called the English style because it was developed in Great Britain. It is characterized not only by the absence of patterns, balance, shearing of plants and other formal features, but by the use of curved lines, groups instead of rows of trees, shrubs and flowers; in short, grace rather than stiffness.

In America, especially in New England and the South Atlantic states, many country places have influenced the development of national taste in landscape gardening. Here during colonial times the modified English style became popular. Some estates still show the beauty of the original designs, although more recent modifications have modernized them. On the whole they have made notable contributions to both architecture and landscape gardening. Among the best known is the home of George Washington at Mount Vernon, Va. Though the property is much smaller than during Washington's day, the residential area has been maintained by an association much as Washington originally laid it out. It is a particularly good example of the artistic use of a natural landscape.

During the latter part of the colonial period supplies of landscape materials in America became greatly enriched through the importation of foreign trees and shrubs, especially by John Bartram, Peter Collinson, Thomas Jefferson and Benjamin Franklin, all of whom introduced and tested such plants on their own places. Their efforts were widely extended by the Prince Nurseries of Flushing, Long Island, and the Winship Nurseries of Boston. Many of the trees originally planted by these men and companies still stand, the most notable of them being in John Bartram's garden, which is now included in the park system of Philadelphia.

André Parmentier, a Belgian, arrived in America about 1824 and established a nursery on ground which has since become the center of Brooklyn, N.Y. His taste, skill and knowledge of plants soon led to his designing countless estates, not only in the neighborhood of New York, but from Canada to the Southern States. Of him his famous successor, Downing, wrote that his labors and example did more directly for American landscape gardening than those of any of his predecessors or contemporaries.

The first notable, professional American landscape gardener, was Andrew Jackson Downing of Newburg, N.Y. Not only did he design many of the most beautiful estates along the Hudson River and in New England, but being the outstanding man of his time he laid out the grounds of the National Capital, the Smithsonian Institution and the White House at Washington. In a very broad sense he was the father of American landscape gardening, being the author of the first, and still valuable, American book on the subject and the preceptor of several prominent exponents of the art, especially Frederick Law Olmsted and Calvert Vaux who laid out Central Park, New York City, the principal parks of Brooklyn, Boston, Detroit, Rochester, the World's Fair at Chicago and the campus of many colleges, notably the Michigan State College at East Lansing.

Landscape Architecture. Olmsted merits the major share of credit for the type of American landscape gardening that characterizes the past half century and of to-day. Largely due to his influence the architectural style of planning is now restricted to the immediate vicinity of buildings, especially those of a public and semipublic nature. One of his chief contributions to the naturalistic style is the use of shrubbery in extensive borders and masses rather than as individual specimens.

His designs and those of his followers are characterized by the almost total abandonment of straight lines, right angles, balanced and patterned figures, except in the most formal surroundings. They present informal, irregular, naturalistic or picturesque views approached or bordered by inconspicuous curvilinear walks and drives, graced by groups instead of avenues of trees and shrubs, and brightened by flowers which are made to appear as if planted by Nature. Thus his graceful effects replace the stiff formality and regularity of the geometric style and are almost as readily adapted to small places as to extensive grounds.

As landscape gardening is distinguished from gardening by being concerned with art rather than plants as individuals, it is dependent for its effects upon good taste, not arbitrary rules. Fundamentally it aims to make pictures with plants and other materials and therefore presupposes "an artistic temperament and an inherent love of nature; . . . an intimate knowledge of plants; and . . . familiarity with various arts and handicrafts, as the making of roads, grading, draining, enriching the land."

Whereas the painter of landscape pictures need only represent on canvas or other medium such views as may be attractive, pleasing or interesting, the landscape gardener must first concern himself with the use to be made of each part of the grounds he is to lay out and then compel these conditions to be subservient to beauty. His problems are therefore far more intricate than those of the painter. The painter need only select an already existent scene to represent, omit undesirable features and finish his picture in a few days, weeks or months; whereas the landscape de-

signer must often originate beauty where perhaps little or none existed and often work and wait for years before his landscape develops into the picture he planned.

Landscape gardening is now well established among artists, architects and in popular esteem. Hundreds of men and women now practice it professionally, many colleges offer well-attended courses in it, and two national associations, the American Society of Landscape Architects and the American Association of Park Superintendents, have extensive memberships. Various horticultural societies and several other associations interest themselves in the general subject, especially the American Scenic and Historical Society and the American Civic Association. City planning is also gaining in popularity and to a less degree so is country planning, more especially within a 50-mile radius of the larger cities.

Among the many American periodicals that now devote liberal space to this subject the following are conspicuous: *Landscape Architecture, House and Garden, House Beautiful, Home and Field, Country Life in America, Better Homes and Gardens, Gardeners' Chronicle,* and *Park and Cemetery and Landscape Gardening.* Authoritative European books on the subject are: *Observations on the Theory and Practice of Gardening,* Repton; *The Parks and Promenades of Paris,* Robinson; *L'Arts des jardins,* Andre; *The English Flower Garden,* Robinson; *History of Gardening in England,* Amherst. American books include *A Treatise on Landscape Gardening,* Downing; *Landscape Gardening,* Waugh; *Italian Grounds,* Platt; *How to Lay Out a Garden,* Kemp; *The Landscape Beautiful,* Waugh; *Art Out-of-doors,* Van Rennselaer. M. G. K.

LANDSCAPE PAINTING IN AMERICA. American art has perhaps made its most distinctive progress since the early 19th century in the field of landscape painting. The poetry of WILLIAM CULLEN BRYANT and the novels of JAMES FENIMORE COOPER had aroused new interest in solitary and wild nature. Thomas Doughty (1793-1856) was the pioneer outdoor painter, but THOMAS COLE and ASHER DURAND were the first to paint landscape professionally and were the founders of the American landscape school. Cole, a romantic idealist, compiling his landscapes of classic grandeur from various sources, was a poor colorist and draftsman yet had the power of communicating his own delight in nature. He gave momentum to American landscape painting. Durand, on the other hand, was a trained engraver until after he was 30, and transcribed nature with meticulous precision. Around Cole and Durand sprang up a group of young artists with a desire to create a new spirit of nationalism and recognition of the natural beauties of their country through a native school of landscape painting.

These artists, who became known as the HUDSON RIVER SCHOOL, had nothing of art tradition or method, but with enthusiasm they learned from each other, and took such meager instruction as they could get from Cole and Durand. They worked out a serviceable technique, but were so engrossed in reproducing the actual appearance of objective nature that they disregarded its varying moods and spiritual significance. Their work suffered from immaturity and want of accumulated art experience. Lacking in color sense and in breadth, they could swing easily from conventional brown foliage and restricted crowded canvases to the grandiose panoramic style. Yet in spite of these insufficiencies they roused a great enthusiasm for primitive nature and pride in the previously unrecognized grandeur and beauty of American landscape; herein they laid a broad and permanent foundation for a national school. Representative of this group were John F. Kensett (1818-72), John W. Casilear (1811-93), Thomas A. Richards (1820-1900), William T. Richards (1833-1905), Worthington Whittredge (1820-1910), J. F. Cropsey (1823-1900), John Bristol (1826-1909), Jervis McEntee (1828-91), James Hart (1828-1901) and William Hart (1823-94).

With the discovery of gold and the opening up of the West, the imaginations of certain artists were fired to portray the immensity and coloring of the new region as a more lofty conception of the national spirit. The immediate popularity of Thomas Hill (1829-1908) and Albert Bierstadt (1830-1902) was out of all proportion to the merit of their vast canvases, depicting the wonders of the Rocky Mountains and the Yellowstone. American taste at the time was more avid for a photographic view of this marvelous new country than for an interpretation of its feeling or meaning. Pictures were painted to please popular taste and for exhibition. Thomas Moran (1837-1926) settled in California and acquired fame through his painting of the Yosemite. Frederic E. Church (1826-1900) became the artist explorer, roaming from the Andes to Labrador in quest of the "biggest thing on earth"; his *Niagara* found great favor. The pioneer work of these men was consistently in keeping with the spirit of the time and reflects an atmosphere of frank and sincere love of nature. Practically all the Hudson River group sooner or later found their way to Europe. Emanuel Leutze (1816-68), best known as the painter of *Washington Crossing the Delaware,* had much influence in directing these men to the DÜSSELDORF SCHOOL, which tended only to emphasize their defects. There was an immediate and beneficial response, however, to the discovery by William M. Hunt (1824-79) of the BARBIZON SCHOOL, and an increasing appreciation of the merits of French art tradition and perfected technique.

The three artists, known as the fathers of American landscape, who owed their inspiration to the Hudson River School though they were aware of its weaknesses, were George Inness (1825-94), Alexander Wyant (1836-92) and Homer Martin (1836-97). Preeminent now as then stands GEORGE INNESS. He never accepted a master or a technique, but to the end of his life experimented and assimilated from every avail-

able source, unreservedly changing his style whenever new methods offered him fuller expression. He was among the first to find his way to France and the Barbizon group. Poet and mystic, he entered into the Barbizon spirit of "seeing nature as a visible expression of some great unknown design." Inness's scenes are confined to a range of 50 miles about New York, yet his provincial landscapes have a universal appeal. He was the first to bring to American art a deeper appreciation and love of intimate, everyday surroundings.

Through the influence of Inness, Alexander Wyant abandoned the minute, particularizing methods of the Hudson River School and cultivated a more simplified feeling for landscape The charm of his work with its silvery, lyric tone developed in spite of a struggle against neglect and invalidism. HOMER MARTIN was essentially a painter of the solitude and stillness of American landscape. He strove to express the essential and elemental quality of nature. As the best work of Wyant was attained through his effort to paint with his left hand, his right having become paralyzed, so Martin gained his best massed effects contending with an encroaching blindness.

The artist who best personifies American nationalism is perhaps WINSLOW HOMER (1836-1910), one of the greatest of sea painters. His genius asserted itself when he was 60, in the isolation of the Maine coast; it was not, however, a gift appearing suddenly out of thin air. The deeper values of his work developed under the compression of his solitude and taciturnity. His dexterity and discernment for the salient features of characterization were gained through years spent in the reporting of fact for magazine illustration. Another great and influential American artist, cosmopolitan and with eclectic training, is JOHN LA FARGE (1835-1910). His few landscapes are excellent, but he is best known through his mural decorations, in which his landscape backgrounds are a distinguishing feature. JOHN SARGENT (1856-1925), another of this group, produced admirable landscapes, but was more important in PORTRAIT PAINTING and WATER COLOR PAINTING. ALBERT RYDER, Elihu Vedder, Ralph Blakelock and ARTHUR DAVIES wove imaginative landscapes out of fancy. A group of notable landscape and sea painters not easily classified are Dwight Tryon, William Bunce, Ben Foster, Francis Murphy, Leonard Octman, Charles Davis, Bruce Crane, Eduard Steichen, Birge Harrison, Henry Ranger, Gardner Symons and Elmer Schofield.

The movement known as IMPRESSIONISM, or more accurately, LUMINISM, has had far-reaching effects. Tempered and adapted to the requirements of the American school, it has supplied one of the greatest deficiencies of the Hudson River School, the viewing of a landscape through its enveloping atmosphere. The chief exponents of this movement are Theodore Robinson, Childe Hassam, John Twachtman, Willard Metcalf, Thomas Harrison, Henry Snell, Emil Carlsen, Henry Dearth, William Ritschel, Edward Redfield, Paul Dougherty, Daniel Garber, Ernest Lawson, Dodge MacKnight and Gifford Beal. Other painters of the modern school of American landscape are GEORGE BELLOWS, Charles Burchfield, Jonas Lie, Edward Hopper, Rockwell Kent, Leon Kroll and Georgia O'Keefe.

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LANDSEER, SIR EDWIN HENRY (1802-73), English animal painter, was born at London, Mar. 7, 1802. His precocious talent for drawing led him to exhibit at the Royal Academy at the age of 13. Landseer's reputation was established in 1818 with *Fighting Dogs Getting Wind,* one of the best of his early, unsentimental canvases. After 1823 his work began to decline in careful draughtsmanship, but he continued to paint with amazing rapidity and dexterity. *Monarch of the Glen* and *The Old Shepherd's Chief Mourner* are the best known work of a painter whose appeal was due largely to the popular appeal of his subject matter. Landseer died at London, Oct. 1,

LAND'S END, a granite promontory jutting out of Cornwall and forming the extreme westerly point of England, the termination of the granite masses rising through Cornwall. Off the tip of the mainland it is surrounded by dangerous reefs which are marked by the Longships lighthouse.

LANDSHUT, a Bavarian city picturesquely situated on the Iras River about 38 mi. northeast of Munich. It has stately brick churches and gabled houses. Nearly all of the important buildings are along the wide main street in the section called the "Old Town." The Holy Ghost Church is an edifice of the 15th century; other notable buildings are the former palace of the dukes of Bavaria-Landshut, the rathaus of 1446 and St. Martin's Church, begun before 1392 and completed in 1432. South of the city is the Burg Landshut, begun in 1180 and later changed from a fortress into a residence. The late-Romanesque castle church is noteworthy. The Dominican Cloister, founded in 1271, was used to house the university, moved from Ingolstadt, from 1800 to 1826, when it was established in Munich. There is a large number and variety of factories and a large trade in grain. The annual performance in July of the *Landshuter Hochzeit,* 1475, one of the great historical festival plays of Germany, is given in Landshut. Pop. 1925, 26,105.

LANDSLIPS, the sliding of masses of earth and rock from steep hill or mountain slopes. These occur either when railroad, canal or stream cuttings undermine the support of upper layers, or when rain or ground-water so increase the weight as well as the mobility of the soil mass as to overcome its cohesion and bring it down in an earth avalanche. Earthquake tremors sometimes precipitate an impending slide. Repeated landslips enormously increased the difficulty of excavating the Panama Canal. A slide from the Rossberg, Switzerland, in 1806, buried the village of Goldau and caused six hundred deaths. Another in a deep and steep valley of the Ganges,

in 1893, brought down 8,000,000,000 tons of rock, dammed a valley, and created an artificial lake four miles long, the overflow of which a year later caused a serious flood. Certain valleys of the Rockies of southern Colorado are noted for great slides.

LAND TENURE, the manner whereby lands or interests therein are held or owned. Tenure is derived from the Latin *tenere,* meaning to hold. Under the feudal system in England all land was considered as belonging to the Crown. Thus, subjects held land by grant from the king, but on condition that certain services be rendered and that fealty be shown. The tenant holding land by military tenure was required to engage in military service on the king's behalf. In this sense land tenure has no existence in the United States. The landowner owes no obligation of fealty to a sovereign or overlord as in the feudal system in England, but has only the liability to taxation by the state.

LANDWEHR, THE, or "Land Defense," the German military designation for the home reserves, The modern Landwehr system was originated in 1806 by a Prussian, Maj. Knesebeck. After 1871 the plan was set in force throughout the German Empire. After serving the prescribed term in the regular army, the citizen passes into the Landwehr as a reservist, remaining therein until the age of 39. During the World War, German Landwehr divisions saw active service on the eastern front and were employed as second-line troops in the western theater. Similar Landwehr organizations existed up to the time of the Armistice, 1918, in Austria-Hungary. The present-day Swiss Landwehr includes all reservists between the ages of 33 and 40.

LANE, EDWARD WILLIAM (1801-76), English scholar, was born at Hereford, Sept. 17, 1801. He studied engraving in London before going in 1825 to Egypt. He remained there for 3 years, collecting material and making drawings for an elaborate *Description of Egypt.* After a second visit to Egypt in 1833-35, during which time he lived as a Mohammedan, he published his *Account of the Manners and Customs of the Modern Egyptians.* Later he prepared a valuable *Arabic-English Lexicon* and published the first accurate English translation of the celebrated ARABIAN NIGHTS. Lane died at Worthing, Aug. 10, 1876.

LANE, FRANKLIN KNIGHT (1864-1921), American statesman, was born near Charlottetown, Prince Edward Island, on July 15, 1864. He graduated from the University of California in 1886, became a reporter, and later editor and part owner of the Tacoma *Daily News.* He was admitted to the bar in 1889, practiced law in San Francisco, became city attorney in 1897, and was twice reelected. In 1903 he was elected on the Democratic ticket to the United States Senate, and in 1905 was appointed by President Roosevelt to the Interstate Commerce Commission, where he served conspicuously for eight years. He was Secretary of the Interior under President Wilson, 1913-20, and was influential in developing the resources of Alaska by securing the government railway there in 1914. He died at Rochester, Minn., on May 18, 1921.

LANE, GEORGE MARTIN (1823-97), American Latin scholar and educator, was born in Charleston, Mass., Dec. 24, 1823. He graduated at Harvard in 1846, after which he studied for four years in German universities. In 1851 Lane returned to Harvard as professor of Latin, and during his long term of service there, extending to 1894, awakened new interest in the study of Latin by his original and scholarly methods of teaching. His publications include *Latin Pronunciation* and *Latin Grammar.* Lane died in Cambridge, Mass., June 30, 1897.

LANE COLLEGE, at Jackson, Tenn., a privately controlled, coeducational institution for Negroes, was founded in 1882 by the Colored Methodist Episcopal Church, and was opened nine years later. It comprises preparatory, arts and sciences, home economics, music and theological departments, a summer school and extension courses. The productive funds in 1931 were $31,000. The library contained 7,500 volumes. In 1931-32 there were 621 students and a faculty of 20, headed by Pres. J. F. Lane.

LANE-POOLE, STANLEY (1854-), English historian and archaeologist, was born in London, Dec. 18, 1854. He was educated at Oxford, and in 1874-92 was employed in the coin department of the British Museum. In 1895-97 he lived in Cairo, engaged in archeological research for the Egyptian government, and in 1898-1904 occupied the chair of Arabic at Trinity College, Dublin. His many important publications include *The Mogul Emperors, Egypt in the Middle Ages, Essays in Oriental Numismatics, Studies in a Mosque* and *Lane's Koran.*

LANETT, a city in the eastern part of Alabama, in Chambers Co., situated on the Chattahoochee River, 88 mi. northeast of Montgomery, served by bus lines, river craft and two railroads. The principal crops of the vicinity are cotton, corn and melons. The chief industries are those connected with textiles. Lanett was incorporated in 1893. Pop. 1920, 4,976; 1930, 5,204.

LANFRANC (c. 1005-89), celebrated churchman and first Norman Archbishop of Canterbury, was born at Pavia, Italy, about 1005. After having obtained remarkable distinction as a teacher and man of learning, Lanfranc became first abbot of a monastery at Caen, France. He was appointed Archbishop of Canterbury following William I's conquest of England in 1066. He was powerful politically, and in the absence of William acted as regent. Lanfranc died in 1089.

LANG, ANDREW (1844-1912), Scottish writer, was born at Selkirk, Mar. 31, 1844. He was educated at St. Andrew's University and at Oxford. His extraordinary versatility gave him fame as a journalist, critic, historian, classical scholar, student of myths, writer for children, and poet. He wrote articles and criticisms for the *Daily News* and the *Morning Post,* searched out mysteries of Scottish and French history,

delved deep into folklore, and through his collections of fairy and true tales for children has given unmeasured delight to boys and girls. With S. H. Butcher Lang translated the *Odyssey,* and with Leaf and Myers, the *Iliad.* Among his many books are *The Mystery of Mary Stuart, Custom and Myth, Ballads and Lyrics of Old France, Blue Fairy Tale Book* and its followers, *History of Scotland* and *Letters to Dead Authors.* He died at Banchory, Aberdeenshire, July 20, 1912.

LANGDON, JOHN (1741-1819), American revolutionary leader, was born at Portsmouth, N.H., June 25, 1741. As a youth he began mercantile work at Portsmouth and became one of the leading merchants and shipowners of the city. With the rise of revolutionary sentiment he took part in the seizure of Fort William and Mary at New Castle, N.H. in Dec., 1774, and accepted the commission of Naval Agent for the Continental Congress to secure the construction of ships at Portsmouth. In 1777 he became Speaker of the General Assembly of New Hampshire, and at the time of Burgoyne's threatened invasion, pledged his wealth to equip troops, while he served as a captain at the battles of Bennington and Saratoga. As a New Hampshire representative in the Congress of the Confederation (1786-87), he became convinced of the need of a stronger union, participated in drafting the Constitution, and was instrumental in obtaining ratification by New Hampshire. For a period in 1788 he served as President of New Hampshire, resigning to represent his state in the first Senate, over which body he presided as first President pro tempore. From 1794 to 1804 he was a Representative in Congress and though he gradually drew away from his earlier Federalist position he refused to become a Republican and declined Jefferson's proffer of the post of Secretary of the Navy, though in 1812 he supported Madison's war policy. Langdon's last political office was the Governorship of New Hampshire from 1805 to 1808 and in 1810 and 1811. He died at Portsmouth, Sept. 18, 1819.

LANGE, CHRISTIAN CHRISTOPH ANDREAS (1810-61), Norwegian historian, was born at Stabak, Aug. 13, 1810. He was the author of *The History of the Norwegian Cloisters in the Middle Ages* and co-author with C. R. Unger of *Diplomaticum Norvegicum,* a voluminous collection of source material concerning the life, language and customs in medieval Norway. Five volumes of this work had appeared up to the time of Lange's death. Other historians have since carried on along the lines indicated by him. Lange's importance lies in his research work and his arrangement of material. He died at Oslo, May 10, 1861.

LANGLAND, WILLIAM (c. 1332-c. 1400), widely believed to be the author of *Piers the Plowman.* There is no information regarding his place of birth, his exact dates of birth or death, or even his correct name, all knowledge of him being gleaned from comments and allusions in his poem. According to these, he appears, while wandering in the west of England, in 1362, to have had visions of remarkable occurrences, during sleep. These visions are related in the poem entitled *Vision of William Concerning Piers the Plowman.* Recent opinion has tended to the belief that the poem is the work, not of one, but of five authors, this opinion being based on differences of style and spelling, as found in the work. But if so, we have no more knowledge of the identity of the authors than of the man called William Langland. It is gathered that Langland was married, and that he earned a very precarious livelihood in London by singing psalms and copying legal documents, but the real facts of his life are as shadowy as the authorship of the famous poem. *See also* PIERS PLOWMAN; ENGLISH LITERATURE.

LANGLEY, SAMUEL PIERPONT (1834-1906), American astronomer and physicist, was born at Roxbury, Mass., Aug. 22, 1834. He was assistant at the Harvard Observatory in 1865, lecturer at the Naval Academy, in 1867 professor at the Allegheny Observatory, and in 1887 director of the Smithsonian Institution. Langley's investigations of the infra-red portion of the spectrum were of great consequence, particularly his invention in 1883 of the bolometer, universally used in astronomy, capable of measuring temperature changes as small as $1 \times 10\text{-}8$ degrees. Langley likewise investigated problems of aeronautics and established the principles of wing designs still in use. In 1896 he built a steam-driven plane which flew, without a pilot, for more than half a mile, the first such machine ever flown. In 1903 he attempted to build a machine which would carry a man but was unable to find a motor sufficiently light in weight. Public ridicule lead Congress to cut off further appropriations for his investigations. Years afterward, however, with a modern motor installed, his original plane flew with perfect success. Langley died at Aiken, S.C., Feb. 27, 1906.

LANGMUIR, IRVING (1881-), American physicist and chemist, was born in Brooklyn, N.Y., Jan. 31, 1881. After graduating from the Columbia School of Mines he studied at Göttingen, where he received his doctorate in 1906. He was instructor in chemistry at the Stevens Institute in Hoboken, N.J., in 1906-09, and in 1909 joined the staff of the General Electric Co., in 1928 becoming associate director of its Research Laboratories at Schenectady, N.Y. Among his widely known inventions are those of the gas-filled electric lamp, and the method by which hydrogen gas in the atomic state is used in welding. His work on electric discharges in high vacuum led to important applications in modern radio. He has been the recipient of the Faraday and Rumford medals, and in 1932 was awarded the Nobel Prize in Chemistry.

LANGTON, STEPHEN (? -1228), Cardinal and Archbishop of Canterbury, was born at a place and time unknown. He became a celebrated theologian, and, in spite of the opposition of King John, he was consecrated Archbishop of Canterbury by Pope Innocent III. The king's opposition to this resulted in the notorious quarrel between John and the Church,



1, 2, COURTESY METROPOLITAN MUSEUM OF ART; 3, DURAND-RUEL, NEW YORK; 4, REINHARDT GALLERIES, NEW YORK

FRENCH AND ENGLISH LANDSCAPE PAINTING IN THE EIGHTEENTH-TWENTIETH CENTURIES

1. "Glebe Farm with a View of Langham Church," by John Constable (1776-1837). **2.** "The Grand Canal, Venice," by Joseph Mallord William Turner (1775-1851). **3.** "Seine à Lavacour," by Claude Monet (1840-1926). **4.** "Harbor of Toulon," by Émile Othon Friesz (1879-).



1. COURTESY METROPOLITAN MUSEUM OF ART; 2. REINHARDT GALLERIES, COLLECTION OF MR. AND MRS. WALTER HOCHSCHILD

SPANISH SIXTEENTH CENTURY AND MODERN FRENCH PAINTING

1. "View of Toledo," by the Spanish master, El Greco (1542-1614).
2. "Sacré Coeur," by Maurice Utrillo (1883-), a member of the modern French school.



COURTESY METROPOLITAN MUSEUM OF ART

FLEMISH AND SPANISH PAINTING

1. "City on a Rock," by Goya y Lucientes (1746-1828), Spanish.
2. "The Harvesters," by Peeter Breughel the Elder (1525?-70?), Flemish.



1. COURTESY CLEVELAND MUSEUM OF ART; 2. FRANK K. M. REHN GALLERY, NEW YORK

MODERN AMERICAN PAINTING

1. "The Race Track, or Death on a Pale Horse," by Albert P. Ryder (1847-1917).
2. "My Garden," by Leon Kroll (1884-).

in which England was placed under an interdict that lasted eight years, and King John was excommunicated. Langton's actions were always vigorous, though combined with moderation and a sense of the value of conciliation. This policy enhanced his popularity with both commoner and noble, and, although he was removed from his archbishopric by the pope and exiled for three years, his influence can be seen in the Magna Charta granted by King John at Runnymede, 1215. Langton died at Slindon Manor, Sussex, July 9, 1228.

LANGUAGE, in the widest sense of the term, any means or method of communicating emotion or thought between two or more living beings; more specifically, such communication between two or more human beings, whether orally between those possessing at least approximately normal vocal and auditory apparatus, or in writing between those possessing normal powers of sight, or, in the case of the blind, of touch.

In a most restricted sense, language is a mode of speech current in a given area, i.e., a system of conventional complexes of sounds, forms and arrangement of vocables (words and phrases) mutually intelligible to the vast majority of normal individuals living in or native to the area in question. Examples of the first sense are the various cries and emotional movements of animals, whether between themselves or between them and human beings, and the extensive use of SIGN-LANGUAGE; of the third, French, German, English, etc.; the second being the sum total of all such specific languages. The term is further used to denote fancied intercommunication of inanimate things with each other or with human beings, as "the whispering of the leaves," this sense, now only poetic, having its foundation in ANIMISM. In soliloquy, which forms only an apparent exception to this definition, the subject divides his personality—one half, the speaker, addressing the other half, the auditor.

Language is conditioned mechanically by the physiological structure of the organs of speech and hearing; and psychologically by the processes of thought, various lesions or other injuries to the brain resulting in more or less grave impairments of speech or hearing. It is a powerful factor in creating and maintaining national consciousness; and, particularly when studied etymologically (*see* ETYMOLOGY), throws valuable light on the history and development, sometimes even on the origin, of many aspects of mental and material civilization. On the other hand, it bears no necessary relation to race, and its origin is so obscure that it can scarcely be discussed seriously. This origin has formed the subject of many guesses—emotional cries, rhythmic chants, sounds emitted by the vocal organs while more or less unconsciously imitating the movement of the hands, etc., engaged in toil; supposed sociological and behavioristic necessities, etc. Any or all of these may perhaps have been factors; but none of them has been shown to be the actual source. Language is known comparatively very recently in the history of the human race—at most only during the last 6,000 years. Then it appears already highly developed; so-called primitive languages give no help, for they also are very complex and have evidently passed through long evolutions; the study of children learning to talk is useless, for they only imitate, more or less perfectly, the existing speech of their elders.

Neither does it seem possible to say that languages improve or decline, or that one is better or worse than another; the most that can be said is that they change and pass out of current use (becoming "dead languages"), and that some are better adapted to the needs—at least during certain periods and stages—of certain communities than are others. *See also* CLASSIFICATION OF LANGUAGES; FAMILY, LINGUISTIC; LINGUISTICS.

L. H. G.

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LANGUAGE, SIGN. *See* SIGN LANGUAGE.

LANGUAGES, CLASSIFICATION OF, the arrangement of all the known languages of the world in linguistic families (*see* FAMILY, LINGUISTIC). Earlier attempts at such classification were based chiefly on outward form ("isolating," "polysynthetic" or "incorporating," "agglutinative," "inflectional" and "analytic"), racial differences, and psychological grouping; but the only system at present deemed scientific is the "genealogical" classification. This is founded essentially on the observed fact that if, in a number of languages, there is a regular correspondence of sounds in words or forms of similar meaning (*see* LAW, PHONETIC), the languages showing such correspondences are related; if no such correspondence can be shown to exist, the languages in question are not akin. Similar correspondences must also be found to exist in the inflectional systems of the languages considered before they can be classed together; but, contrary to the popular impression, similarity of vocabulary is practically negligible as a test of relationship, since languages borrow freely from the most heterogeneous sources, and SYNTAX, while occasionally useful, is here of minor importance.

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LANGUED'OC. The geographical use of the term Langued'oc does not extend as far as the linguistic. Geographically Langued'oc lies between the upper waters of the Garonne and the Rhone, south of the Dordogne, the western part of the Roman province of Gallia Narbonensis. It was overrun by the Goths during the 5th century and conquered from them by the Franks during the 8th. In 817 it was organized as the Duchy of Septimania, but under the disintegrating influence of subinfeudation and the pressure of Saracen raids, Septimania disappeared and not until the 11th century did one political entity again occupy Langued'oc, the County of Toulouse. In the hands of Count Alphonse Jourdain, Toulouse

was extended throughout the entire district, and his successors, in alliance with the kings of Aragon, bid fair to create a permanent, independent nation in what is now southern France. The Albigensian Crusade (*see* FRANCE, HISTORY OF; ALBIGENSES) destroyed the County of Toulouse. In 1229 all the lands east of Carcassonne were ceded to the King of France and Jeanne, heiress of Count Raymond VII, was forced to marry Alphonse of Poitiers upon whose death without children in 1271 the remainder of Langued'oc reverted to the French Crown.

LANGUEDOC CANAL, or **CANAL DU MIDI,** in southern France, constituting a link between the Mediterranean and the Atlantic. Beginning near the mouth of the Garonne and extending as far as the Étang de Thau, in the Mediterranean, the course of this waterway runs 600 ft. above sea level for a distance of 148 mi. It is approximately 60 ft. wide, and 6½ ft. deep; there are 119 locks, 50 aqueducts and vessels of 100 tons are permitted passage through the canal. Construction of the canal was completed in 1681 at a cost of $3,500,000.

LANIER, SIDNEY (1842-81), American poet and musician, was born at Macon, Ga., Feb. 3, 1842. He was educated at Oglethorpe College, joined the Confederate army at 19, was imprisoned and contracted tuberculosis. Despite this Lanier became one of America's leading poets. He decided to devote himself to poetry and music after a brief effort to practice law, and obtained a position in 1873 with a Baltimore orchestra as first flute. *Corn* appeared in *Lippincott's Magazine* in 1875. Meantime, the author's health constantly failing, he wrote tales for boys from classic works, a guide book to Florida and, above all, poems. *The English Novel* consists of lectures given at Johns Hopkins University; *The Science of English Verse* stresses Lanier's theories of the relationship between poetry and music. Two of his best poems, *Sunrise* and *The Marshes of Glynn,* were written when he was dying; they make part of his *Hymns of the Marshes.* He died at Lynn, N.C., Sept. 7, 1881.

LANKESTER, SIR EDWIN RAY (1847-1929), English zoölogist, was born at London, May 15, 1847. From 1874 to 1890 he was professor of zoölogy at University College, London, 1891 to 1898 at Oxford, and after a brief period with the Royal Institution, director of the Science section of the British Museum. He was knighted in 1907. His writings include *Extinct Animals, Comparative Longevity, The Kingdom of Man,* and others on zoölogy. Lankester died Aug. 15, 1929.

LANSBURY, GEORGE (1859-), British Socialist and labor leader, was born Feb. 21, 1859, in Suffolk. After receiving some education in elementary schools he worked at various occupations. In 1884 George migrated to Australia, but returned the next year and entered his father's lumber company. A constant supporter of socialist principles, he was elected to Parliament on that platform from Bow in 1910, and again in 1922, continuing thereafter to hold the same seat. Lansbury was chairman of the National Labor Party in 1927-28, a member of the London County Council and held other local public offices. He has also been active in the establishment of several labor colonies. He was editor, 1912-22, of the *Daily Herald* and has published many pamphlets on unemployment, socialism, the poor law and other subjects. Among his books are *Your Part in Poverty, These Things Shall Be, What I Saw in Russia* and *My Life.*

LANSDALE, a borough in Montgomery Co., southeastern Pennsylvania, situated 25 mi. north of Philadelphia; served by the Reading Railroad. The region is good farming country; the borough has various factories producing pottery, iron and steel products, hosiery and wood and metal specialties. It is the seat of St. Mary's Institute for the Blind. Lansdale was incorporated in 1872. Pop. 1920, 4,728; 1930, 8,379.

LANSDOWNE, a residential suburb and borough in Delaware Co., southeastern Pennsylvania, situated six mi. west of Philadelphia. Lansdowne is served by the Pennsylvania Railroad. Pop. 1920,

LANSFORD, a borough in Carbon Co., in eastern Pennsylvania, situated in a rich anthracite coal region, 50 mi. south of Wilkes-Barre; it is served by two railroads. The borough has silk mills and clothing factories, but the chief industry is mining. Lansford was incorporated in 1877. Pop. 1920, 9,625; 1930, 9,632.

LANSING, ROBERT (1864-1928), American statesman, born at Watertown, N.Y., on Oct. 17, 1864. He was graduated from Amherst in 1886, took up law, and was admitted to the bar in 1889. He became a member of the firm of Lansing and Lansing in New York City in 1889, remaining until 1907. He was married in 1890 to Eleanor Foster. In 1892-93 he was United States counsel in the Bering Sea Arbitration and in 1903 before the Alaskan Boundary Tribunal. He appeared at The Hague in 1909-10 in the North Atlantic Coast Fisheries Arbitration, and acted as counsel for the department of state in 1914-15. In the latter year he was appointed secretary of state by President WOODROW WILSON, whom he assisted in the delicate correspondence with foreign nations preceding the entrance of the United States into the World War. He resigned in 1919 before the administration term was finished. He was a member of the American Commission to Negotiate Peace at Paris in 1918-19. He died at Washington, D.C., on Oct. 30, 1928. His published works include: *The Peace Negotiations,* 1921; *The Big Four and Others of the Peace Conference,* 1921; and *Notes on Sovereignty,* 1921.

LANSING, the capital of Michigan, is situated in Ingham Co., in the southern part of the state, at the confluence of the Grand and Cedar rivers, about 85 mi. northwest of Detroit. The city is served by the Michigan Central, the Père Marquette, the Lake Shore and Michigan Southern and the Grand Trunk railroads and bus lines. There is an abundance of water power,

the Grand River having a fall of 18 ft. within the city limits. In 1929 the manufactures, including agricultural implements, automobiles, pumps and engines, automobile accessories, iron work, machine-shop manufactures and beet-sugar products, were valued approximately at $219,000,000; the retail trade amounted to $54,492,368. Lansing is the seat of the Michigan School for the Blind, the State Industrial School for Boys, and the Michigan State College of Agriculture, located in the suburbs. The city also has several libraries, the handsome state capitol set in a beautiful park, and many recreation centers. Lansing was chosen for the state capital in 1847, was chartered as a city in 1859, and in 1912 received a new city charter. Pop. 1920, 57,327; 1930, 78,397.

LANSING-ISHII AGREEMENT, the exchange of notes on Nov. 2, 1917, in which both countries re-affirmed their pledges to support the territorial integrity and the independence of China. The purpose, from the Japanese side, in securing this re-statement of policy was to counteract anti-Japanese suspicions in the United States. One sentence in the notes stated that the two countries realized that propinquity created special relations and that the United States "recognizes that Japan has special interests in China, particularly in the part to which her possessions are contiguous." This was widely cited, in China particularly, as support by the United States for Japan's claims to special rights in China against the Chinese opposition to these Japanese claims. The notes were cancelled Mar. 30, 1923, as a result of the Washington Conference.

LANTANA, a genus of shrubs of the vervain family allied to the verbena. There are about 50 species native chiefly to tropical and subtropical America, a few of which are grown as ornamentals. Various showy forms of the florists lantana (*L. Camara*), with dense heads of scarlet or orange flowers, are grown for ornament in the Southern States. Introduced as a hedge plant in tropical countries, this species has become a pestiferous weed-shrub in India and Hawaii.

LANTERN, a term used in a general sense for a frame covered with a transparent substance to enclose and protect a light. It may be portable or stationary. Ordinary lanterns, as those used by railroad employees and farmers, burn kerosene and consist of a fuel container, burner, wick, glass chimney and a protecting framework. They may be used either for illumination or for signaling. A type of lantern known as the Japanese or Chinese lantern is made of pleated paper and is collapsible.

The projecting lantern, sometimes called magic or optical lantern, is an instrument for projecting on a wall or screen enlarged representations of pictures or figures painted or photographed on glass or transparent film. In its simplest form the projecting lantern consists of a lantern body, source of light, and a system of lenses for projecting the light in such a way as to magnify the object through which it passes. The source of light is either a powerful carbon-arc lamp with an automatic regulating device or a strong incandescent lamp. There are two main types of projecting lanterns, the epidiascope and cinematograph. The epidiascope is used for projecting drawings, book illustrations, and microscopic slides, and is employed by lecturers in illustrating their lectures. The cinematograph is a projecting lantern equipped with a mechanical device which rapidly changes the view projected so that the representation on the screen appears to be in motion. These are used in many homes for showing moving pictures of people and objects of domestic interest.

In architecture, lantern is an open structure containing windows on all sides on the roof of a building; also, applied to towers, as of churches, with a large number of windows.

LANTERN-FLY, a popular name for the numerous species of *Fulgoridæ,* some of which are very large insects. The majority are small. The English name is due to some tropical and Chinese species said to be phosphorescent. Among them is the great lantern-fly of South America (*Fulgora lanternaria*). No member of this family is known to be luminescent. The species differ so widely among themselves that the family seems to have no typical form. Some resemble various Neuroptera; others resemble butterflies and moths. Although all feed on the juices of plants no North American species is troublesome. However, several exotic ones are destructive to crops.

LANTERN PLANT, CHINESE (*Physalis Alkekengi*), a highly ornamental perennial of the nightshade family, native from southeast Europe to Japan and long cultivated in gardens for its bladdery, blood-red fruiting calyx. It grows about 2 ft. high with spreading zigzag branches bearing ovate leaves and whitish flowers. The large, mature, very showy calyx, about 2 in. long, persists on the branches long after the leaves have fallen, whence the name winter cherry sometimes applied to the plant.

LANTHANUM, a metallic chemical element (symbol La, atomic weight 138.9), belonging to the RARE EARTHS, but more common in occurrence than most of them. It was discovered by Mosander in 1840. Its salts are colorless.

LANZAROTE. *See* CANARY ISLANDS.

LAOCOÖN, in Greek mythology, brother of ANCHISES and a priest of APOLLO at Troy. He advised the Trojans to refuse to admit into the city the wooden horse of the Greeks. ATHENA to punish him sent two serpents out of the sea by the island of Tenedos. One story says that they attacked Laocoön and his two sons as they were offering sacrifice at the altar of POSEIDON. Another legend asserts that the serpents destroyed first the sons and afterwards the father when he went to the rescue. The famous group of statuary, called the Laocoön, in the Vatican, depicts their deaths. The sculptors were thought to be three Rhodians of the 1st century B.C., Polydorus, Agesander and Athenodorus.

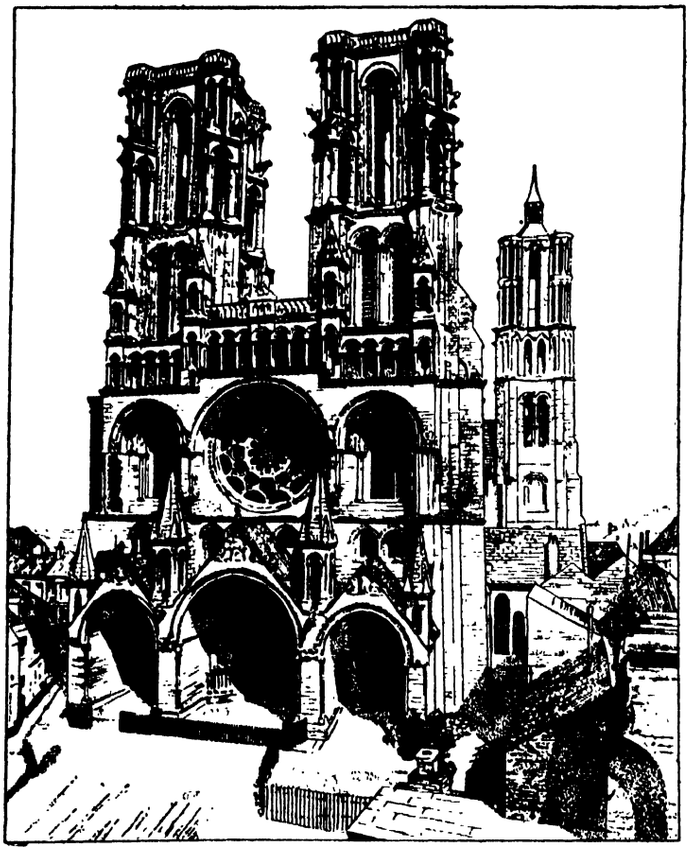
LAODAMIA, in Greek mythology, daughter of Acastus and wife of PROTESILAUS. When her hus-

band was slain by a Trojan, she asked the gods to bring him back to life if only for three days. This prayer was granted, but when Protesilaus died the second time, Laodamia accompanied him.

LAOMEDON, in Greek mythology, king of Troy, was son of Ilus, founder of the city Ilium, and father of PRIAM. POSEIDON built the city walls for Laomedon, and APOLLO watched his flocks, but when the monarch refused to pay for their services, Poseidon sent a dragon to devastate the land and Apollo brought a plague on the people. An oracle said that atonement must be made by the sacrifice of one of the king's daughters, and Hesione, chosen by lot, was chained to a rock to await the return of the dragon. Here HERCULES found and rescued her, but Laomedon, refusing to reward the hero, was slain by him.

LAÔN, a picturesquely situated hill town in northern France, capital of the department of the Aisne. The town was an important stronghold from Roman times. It was occupied by the Germans for almost the duration of the World War. The Abbé Marquette, discoverer of the Mississippi River, was born here in 1673. Pop. 1931, 19,125.

The Cathedral of Notre Dame at Laôn is one of the most interesting of the secondary Gothic cathedrals of France. Though no longer strictly a cathedral, it is still universally so called. Replacing an



WEST END OF THE CATHEDRAL OF LAÔN

earlier church destroyed by fire in 1112, the present edifice dates from the late 12th and early 13th centuries. Its characteristic feature is the unusual cluster of towers, five in number, with which it is crowned. On the central lantern and also on one of the western towers spires were built, but both have disappeared. The west front, mutilated during the Revolution but later restored, is of a notably gracious and beautiful design. Laôn is one of the few French cathedrals built with a square east end, a feature which supposedly owes its being to the influence of an English bishop. The interior of the church recalls that of THE CATHEDRAL OF NOTRE DAME of Paris. Both the nave and transepts are flanked by aisles. The nave has side-chapels, and there is a two-storied chapel at the end of each transept. An unusual rose window lights the east end of the cathedral. Rose windows are also found in the south transept and above the north and west portals. Both the rose windows and the windows in the choir retain excellent stained glass of the 13th century.

LAOS, a protectorate of French Indo-China bounded on the north by the Chinese province of Yunnan, south by Cambodia and Annam, east by Tonking and Annam, and west by the British Shan States and Siam, with an area of 82,604 sq. mi. The territory, consisting of a tangle of forested hills and plateaux, is the least accessible and least developed part of Indo-China. There are large areas of valuable teak forests from which the timber is floated down the Mekong River to Saïgon. The soil of the valleys is fertile; and minerals include gold, lead, tin and precious stones. The natural entry to the country is by the Mekong, but rapids bar continuous navigation at Khone. Steam launches ply on the upper reaches to Vientiane, the capital. Pop. 839,497.

LAO-TZE (c. 590-510 B.C.), an ancient Chinese philosopher whose teachings are the basis of the religion of Taoism. The date and place of his birth are not certain, but the year probably was about 590 B.C. and the place a village in the state of Chu near what now is the city of Kueitehfu in Honan province. His surname was Li; the name of Lao-tze by which he commonly is known means simply The Old One and is a title of respect given him by the people. Exact knowledge of Lao-tze's life is very meager, but apparently he spent most of it in and near his native village, working as a custodian of state records. According to the traditions, he finally became disgusted with the political disorganization and corruption of his times, mounted a water buffalo and traveled out into the west, where he disappeared. At the time he was an old man. He is reputed to have said that he would be reborn in some western country, and when Christianity began to find its way into China many Chinese held that Christ was the reincarnation of Lao-tze. The belief still is current in some parts of China.

One book remains which purports to be from Lao-tze's own hands, the *Tao-Teh-King*. Tradition has it that he wrote this book in response to a request from the guardian of a pass through which he traveled into the West. The book contains about 5,000 characters, and is more a collection of aphoristic and epigrammatic sayings than a consistently reasoned philosophical statement. Many scholars doubt

the story that Lao-tze himself wrote it; it seems to be a compilation of sayings attributed more or less authentically to him rather than the product of his own pen.

Lao-tze taught that behind all things, originating and absorbing them, is the ultimate, indescribable but all-pervading Tao, literally "Way." For him, the Tao, in the sense of the way to happiness, was a complete negation of all action and being, a passive acceptance of life and the world. Man, he said, naturally is innocent and good; perfect virtue and knowledge are to be gained by passive merging of the self into the Tao.

LA PAZ, a city of Bolivia, because of its proximity to the coast the actual seat of the national government, although SUCRE is nominally the Bolivian capital. It is situated 59 mi. southeast of Lake Titicaca in 16° 30′ S. lat. and 68° W. long. La Paz, meaning *peace,* received its name because it was here that Pizarro made peace with his enemies. It is the highest large city in the world, lying 12,700 ft. above sea level. Set 1,000 ft. deep in its canyon among the Andes, with the Chuquiapu River coursing through it, the broad and well-paved streets of La Paz ascend and descend among plain but substantial buildings. There are electric lights and street cars, and the formerly meager water supply is being improved. The problems of provisioning, owing to the difficulties of transportation and the paucity of commodities with which to form a basis of large-scale exchange, have limited the development of the city. The three railroad connections with the coast are causing a change in this condition. In a perpetually cool climate and in a region notably lacking in fuel, it is difficult to keep warm; electricity is widely used as a fuel. La Paz exhibits marked changes of temperature. The annual mean temperature is 50° F.; at noon it sometimes becomes as warm as 80° F., but the nights, about 35°, are cold; June, July and August are the winter months.

La Paz, with shoe, textile and flour mills, is becoming an industrial center. The region abounds in mineral wealth. The cathedral, constructed entirely of stone and begun in the 17th century, is still unfinished. The university has several hundred students and there are five departmental colleges. Founded by the Spaniards in 1548, La Paz has since become the political, social, financial and intellectual center of the republic. Pop. 1930, 149,500.

LAPEER, a city and the county seat of Lapeer Co., eastern Michigan. It is about 60 mi. north of Detroit and about 19 mi. east of Flint. It is served by bus lines and by the Grand Trunk and Michigan Central Railroads. Lapeer's principal industries include flour mills and a stove and machine works. It is in a fertile farming section. It is the seat of the Michigan Home and Training School for the Feeble Minded and Epileptics. Lapeer was founded in 1833 and incorporated in 1869. Pop. 1920, 4,723; 1930, 5,008.

LA PÉROUSE, JEAN FRANCOIS DE GALOUP, COUNT DE (1741-1788), French explorer, born at Guo (Tarn) Aug. 22, 1741. He served in the navy during the Seven Years' War, attaining the rank of captain in 1780. He set out from Brest with two frigates to explore the Pacific in August, 1785. He cruised among the Philippines and then turned northward exploring the seas behind the Japanese Islands, then almost unknown in the west. He discovered the strait, which for a time bore his name (now Soya Strait), between Saghalin and Hokkaido and landed Lessep in Siberia to make his way overland to Europe with the records of the expedition. La Pérouse then turned southward, and halted at Tasmania and Botany Bay (Sydney), Australia, Feb. 7, 1788. He was never again reported. A searching expedition in 1791 learned nothing of his fate. Dillon, an English captain, discovered belongings of the expedition in the hands of the natives of Vanikoro Island in the New Hebrides in 1826. Dumont d'Urville, sent out by France in 1828, satisfied himself that both vessels had been wrecked there and their crews murdered.

LAPIS LAZULI, an azure blue stone used for mosaics, vases, beads and jewelry. It consists mostly of LAZURITE, with some other minerals, and scattered PYRITE which gives the stone a golden-flecked effect. It was popular with the ancients, who called it sapphirus. Until recently it was ground to make ultramarine pigment. The name comes from *lapis,* Latin for stone, and *lajuward,* the Persian name for the stone. It is found in Afghanistan, Siberia, Chile and in California. It is imitated by staining cracked QUARTZ a dark blue, the so-called Swiss lapis. *See also* GEM STONES.

LAPLACE, PIERRE SIMON (1749-1827), French mathematician and astronomer was born in Beaumont-en-Auge, Normandy, Mar. 28, 1749. He studied at Caen, and at the age of 18 went to Paris where he attracted the attention of Alembert, who procured for him a position at the military academy. Quickly rising to eminence, he became a member of the Academy of Sciences in 1785, served for six weeks as minister of the interior under Bonaparte—after the *coup* of the 18 Brumaire—and entered the senate in 1799. In 1817 he was created a marquis by Louis XVIII. The great distinction of Laplace lies in his application of SIR ISAAC NEWTON'S law of gravitation to problems of mechanics in general, and to those of the solar system in particular. His methods and achievements constitute a lasting monument to his genius; his great work *Mécanique Céleste* ranks second only to Newton's *Principia* in scientific importance. A more popular, though hardly less famous work is his *Exposition du Système du Monde,* the 1824 edition of which contains a note which formulates the famous nebular hypothesis. Among his other mathematical investigations are those on the potential function of the mathematical basis of probability and his method of indeterminate multipliers. He died at Paris, Mar. 5, 1827.

LAPLAND, a region of northwestern Europe, without definite limitations and forming no separate

political unit. It stretches from the Norwegian coast to the White Sea and embraces an area of 149,926 sq. mi. Parts of this extensive territory are in Russia, Finland, Sweden and Norway, and all its area is within the Arctic circle. The region consists of rugged mountains, many of which are perpetually covered with snow. The highest peak, Kebnekaisse, 7,000 ft. high, is in Swedish territory. The climate of Lapland is rigorous and renders the development of the natural resources difficult. Thanks to the Gulf Stream the ports are never icebound, although the winters are very severe. There is practically no agriculture, but the mineral wealth is considerable. Its copper and iron deposits are regarded as among the richest in the world. There is an abundant supply of timber and the rivers and lakes swarm with pike, trout, perch and salmon. Immense herds of reindeer are kept by the natives. The Lapps, as the natives are called, are a nomadic people and make their living by hunting and fishing. They are of short stature, but strongly built and of great muscular power. Their language is remotely akin to that of the Finns. They profess the Christian faith and are simple and devout. The population of Lapland is believed to exceed 30,000.

LA PLATA, a city of Argentina, capital of the province of Buenos Aires, at the mouth of the Rio de la Plata. It was founded in 1882, after the city of Buenos Aires, from which it is 30 mi. southeast, had been made the Federal capital. The city is planned on the rectangular system, and possesses fine tree-bordered streets and parks. Fine government, municipal and commercial buildings are found here. The harbor, which is non-tidal, is extensive and well-equipped, and has large docks and warehouses. La Plata is the terminus of several railways and is the headquarters of important industrial and commercial concerns. It has the advantage over Buenos Aires of a deeper basin, which renders its harbor accessible at all times to ships of the highest tonnage. Until 1903 it was the point of call for the large transatlantic liners outward or inward bound. The harbor is three mi. from the town. In 1926 a large refining plant, capable of dealing with 730,000 tons of crude oil a year, was erected. Pop. 1930, 169,678.

LA PLATA, RIO DE. *See* PLATA, RIO DE LA.

LAPOINTE, ERNEST (1876-), Canadian statesman, was born on Oct. 6, 1876, at St. Elois, Canada. He attended Kimouski College and Laval University. He practiced law, was in the House of Commons from 1904 to 1919, was minister of marine and fisheries in 1921, and minister of justice in 1924-30. The treaty between the United States and Canada on the subject of the Pacific fisheries signed while he was minister of marine and fisheries was the first signed by a Canadian minister with full Crown authority. Lapointe was the Canadian delegate at the League of Nations at Geneva in 1922. He was the leader of the Government in the House of Commons during the session of 1926, and served as plenipotentiary at the Naval Conference at Geneva in 1927.

LA PORTE, a city in northwestern Indiana, the county seat of La Porte Co., situated 28 mi. west of South Bend. It is served by the New York Central, the Pere Marquette and the Nickel Plate railroads. Lake Michigan lies 12 mi. north of the city, and several small lakes are in the vicinity. The region is primarily a farming district, producing corn, oats and wheat. The city has diversified industries. In 1929 the manufactures amounted to about $15,000,000; the retail trade was valued at $10,288,926. La Porte was settled in 1830, became a town in 1833 and a city in 1852. Pop. 1920, 15,158; 1930, 15,755.

LAPPING, a finishing operation of machine work in which small amounts of metal are removed by powder or paste ABRASIVES. Originally, the work or the lap was held in the hand for all types of work but at present, largely at the demand of the automotive industry, there are lapping machines for use on round surfaces such as piston pins and crank shaft bearings. Lapping and HONING are sometimes confused. One marked difference between the two operations is that in honing the abrasive is in the form of a "stick" or stone, while in lapping the abrasive is applied in powder or paste form. The amount of metal removed in lapping is very small, seldom exceeding a half thousandth of an inch.

LAPWING, a name given to various plovers with slow flapping flight. The common lapwing or peewit (*Vanellus vanellus*) of the Old World is a handsome crested bird, somewhat more than a foot long, with variegated green, bluish, purple, and black and white plumage. It is found in marshes and open districts from Ireland to Japan, wintering southward to north Africa and India. Its eggs, commercially known as plover's eggs, are sold in large numbers in the European markets.

LARAMIE, a city in southeastern Wyoming, the county seat of Albany Co., situated on the Laramie River, 40 mi. northwest of Cheyenne. Two railroads serve the city. There is an airport. Laramie is a trade center and shipping point for a large territory which has oil fields and ranches raising hogs, sheep and fine cattle, especially registered Herefords. The local industries include oil refining and railroad shop work. Laramie is the seat of the University of Wyoming. The Oregon Trail and the Pony Express Route formerly passed through Laramie. Medicine Bow National Forest and the Pole Mountain Military Reservation are in the vicinity. Laramie was settled in 1868. Pop. 1920, 6,301; 1930, 8,609.

LARCENY. The wrongful taking and carrying away by one person of the personal property of another with intent to convert to the taker's use. A specific intent to take another's property and convert to one's own use without the other's consent is required. Hence if the taker takes under a bona fide, although erroneous, belief that the property is his or that he is entitled to possession of it, there may be a trespass but there is not the crime of larceny. Usually a distinction is made between grand larceny and petty larceny, depending upon the value of the property

stolen. The value required to make grand larceny differs in different jurisdictions. Grand larceny is a felony while larceny is a misdemeanor.

LARCH, the common name for a genus (*Larix*) of resinous deciduous trees of the pine family, some of which are valued for timber and ornament. There are 10 species, found in the colder parts of the Northern Hemisphere. Three species occur in North America. They are tall pyramidal trees with scaly bark; slender, often drooping branches; awl-shaped leaves in crowded clusters, and oblong woody cones. The American larch (*L. laricina*) or tamarack, a small tree of northeastern North America, 25 to 50 ft. high, is sparingly utilized for lumber. The western larch (*L. occidentalis*) of the northwest Pacific states, a massive tree, sometimes 180 ft. high, is extensively cut for lumber, especially in Montana and Idaho. Lyall's larch (*L. Lyallii*), a small tree, 25 to 50 ft. high, grows near the timber line in the northern Rockies and in the Cascades. The European larch (*L. decidua*) and the Japanese larch (*L. Kæmpferi*), both large trees, are grown for ornament in the northeastern states.

LARCHMONT, a village and residential suburb of New York City, in Westchester Co., situated 12 mi. northeast of Manhattan on the north shore of Long Island Sound; served by two railroads. The village, which is included in the town of Mamaroneck, is a popular yachting, fishing and bathing resort. It was the home of JAMES FENIMORE COOPER. The village was incorporated in 1891. Pop. 1920, 2,468; 1930, 5,282.

LARD, the fat of hogs separated from surrounding tissues by rendering (melting and straining). Good lard is white, granular, with the consistency of salve and an agreeable characteristic odor and taste.

Leaf lard comes from the fat in the abdominal cavity, excluding that around the intestines. Back fat yields lard next to leaf lard in quality. Neutral lard is lard rendered at low temperatures (40° to 50° C.). Most of the commercial lard is rendered from the fat of the entire hog except the leaf fat.

Lard is almost pure fat. It has a high energy value, nine calories per gram, and is quite completely digested.

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LARDER BEETLE, a small insect (*Dermestes lardarius*) of the family *Dermestidæ,* also known as bacon beetle, often very injurious to cheese, smoked meats, hides, feathers, skins and other animal substances. The adults are black except for buff-colored basil portion of wing-covers. Serious damage is wrought by the larvæ. When mature, these are dark brown above, whitish below, and covered with long brown hairs. Cleanliness and tight receptacles for food are the best means of control. Old cheese may be used as bait. Fumigation is likewise effective.

LARDNER, RING WILMER (1885-), American writer, was born at Niles, Mich., Mar. 6, 1885. After a public school education he studied at the Armour Institute of Technology, Chicago, in 1901-02, and thereafter was employed as a sports writer by various Chicago newspapers, including the Chicago *Tribune,* in 1913-19. Lardner's independent writings are characterized by the use of American slang, and are mostly humorous satires. Among these are *You Know Me Al,* 1915, *The Big Town, How to Write Short Stories,* 1924, *Round Up,* 1929, and, with George S. Kaufman, *June Moon,* a comedy produced in 1929.

LAREDO, a city and the county seat of Webb Co., southern Texas, situated on the Rio Grande about 156 mi. south of San Antonio. Four railroads, two of them international, and bus lines serve the city. Laredo is the port of entry for Mexican immigrants and a gateway for American tourists entering Mexico. It is a shipping center for the agricultural produce of the district, chiefly cotton, fruit and vegetables. In 1929 the retail trade amounted to $10,400,565. Gas and coal are found in the vicinity. The petroleum field, discovered in 1921, has added greatly to the prosperity of the city. Laredo and Nuevo Laredo once formed a single town, founded in 1755 by Tomas Sanchez of the royal Spanish Army, and named for the Spanish seaport. In 1767 a charter was granted to the city. In 1846 the part on the north bank of the river was captured by the Texans and became a chartered city of Texas in 1852. Pop. 1920, 22,710; 1930, 32,618.

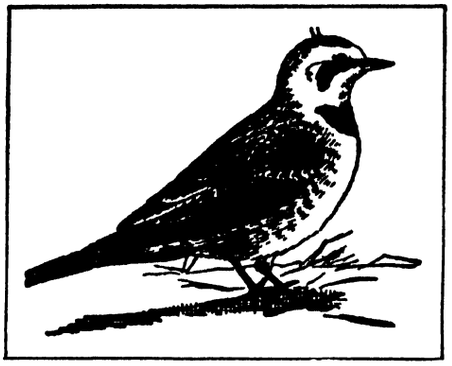
LARES AND PENATES, the household gods of the ancient Romans. The lares were local divinities, the *lar familiaris* being the guardian of the home. The penates, gods of the storeroom, were bringers of wealth and prosperity to the home. Metaphorically, lares and penates refers to those small objects, personal possessions and furnishings which give the home its character.

LARGO, an Italian term used in musical EXPRESSION to indicate a very slow and stately tempo, the slowest that is generally recognized.

LARISSA, most important city of Thessaly, Greece, and seat of the nomarchy of Larissa. It is located on the Salambria River and is about 20 mi. from the Gulf of Salonika. The Athens-Salonika trunk line passes through the city and a branch line connects it with Volos, the port of Thessaly. Until 1881 part of European Turkey, in that year Larissa was annexed by Greece. It still has many Turkish inhabitants, a few mosques and a large Turkish cemetery. For the past 600 years it has been the residence of the Greek Orthodox archbishop of that see. Pop. 1928, 23,899.

LARK, the common name for a family (*Alaudidæ*) of passerine birds, many of which are noted for their melodious song. There are about 100 species, native chiefly to Europe, Asia and Africa. They are small, soberly colored, ground-haunting birds dwelling usually in plains or cultivated lands where they feed upon seeds and insects and build slight nests on the ground. A single species, the horned lark (*Otocoris alpestris*), occurs in North America, nesting from Newfoundland and Labrador to the Hudson Bay region and winter-

ing southward to Georgia. It is about 8 in. long with earlike tufts and yellow markings on the head. About 15 varieties occur in the western United States and Canada and at least two are found in the Old



G. M. SUTTON. "BIRDS OF PENNSYLVANIA."
J. HORACE MC FARLAND CO. COPYRIGHT

PRAIRIE HORNED LARK

World. The most celebrated member of the family is the Old World SKYLARK, a famous song bird.

LARKSPUR, a large genus (*Delphinium*) of herbaceous plants of the crowfoot family. There are upward of 250 species, natives of the north temperate zone, many of which are popular garden flowers. About 100 species are found in North America chiefly from the great plains westward to the Pacific coast. They are erect plants, usually 1 to 6 ft. high, with branching stems, palmately lobed or divided leaves and showy flowers borne in conspicuous clusters. The flowers, prevailingly blue in color but sometimes white, yellow or red, are of unusual form. There are five irregular, petal-like sepals, the upper one prolonged into a hollow spur in which are enclosed the slender spurs projecting from the upper pair of the four irregular petals.

The ornamental larkspurs generally cultivated comprise four distinct groups: 1. the annual rocket larkspurs; 2. the annual forking larkspurs; 3. the perennial rocket or candle larkspurs; 4. the perennial forking or bouquet larkspurs. Among the native species sometimes cultivated are the dwarf blue larkspur (*D. tricorne*), of the eastern states and the cardinal larkspur (*D. cardinalis*) of California.

The foliage, flowers and seeds of most larkspurs are poisonous. Severe losses of cattle by larkspur poisoning occur in western stock ranges. *See also* DELPHINIUM; STAVESACRE.

LARKSVILLE, a borough in Luzerne Co., northeastern Pennsylvania, situated on the Susquehanna River, 2 mi. from Wilkes-Barre. It is in an important anthracite coal region, and mining is the chief industry. It was incorporated in 1909. Pop. 1920, 9,438; 1930, 9,322.

LARNED, JOSEPHUS NELSON (1836-1913), American author, was born in Chatham, Ont., May 11, 1836. After a public school education, he served in 1859-72 on the editorial staff of the Buffao *Express,* and in 1877-97 as superintendent of the Buffalo Library. He edited a *History For Ready Reference,* in 7 volumes, and wrote *Talks About Labor,* a *History of the United States, Seventy Centuries, Books, Culture and Character* and *A Study of Greatness in Men.* Larned died Aug. 15, 1913.

LA ROCHEFOUCAULD, FRANÇOIS DE, 6th DUKE OF (1613-80), French moralist and author, was born in Paris, Dec. 15, 1613. As Prince de Marcillac he was a conspicuous figure in court and military life for 20 years, after which he retired and wrote his memoirs, published under the title *Mémoires sur la Regence d'Anne d'Autriche* in 1662. La Rochefoucauld is best known in literature by his maxims, which appeared anonymously in 1665 as *Reflexions ou sentences et maximes morales;* in point of compactness and in style they are unique. (*See also* MAXIM.) His correspondence is also of great interest and charm, and was first published in 1818 in Belin's edition of La Rochefoucauld's complete works. The great moralist died in Paris, Mar. 17, 1680. *See also* FRENCH LITERATURE.

LA ROCHEFOUCAULD-LIANCOURT, FRANCOIS ALEXANDRE FREDERIC, DUKE OF (1747-1827), French philanthropist, was born January 11, 1747 at La Roche-Guyon. He established on his estate at Liancourt a model farm and founded a school for the children of poor soldiers which later was removed to Chalons as the Ecole des Enfants de la Patrie. La Rochefoucauld was representative of the nobles at the States General 1789, and entered the House of Peers 1799. He was active on the central board of administration for hospitals, prisons and agriculture, and was one of the first promoters of vaccination in France. He died Mar. 28, 1827.

LA ROCHELLE, a picturesque seaport and important fish market on the Bay of Biscay and the capital of the department of Charente-Inférieure. From the 14th to the 17th century it was one of the greatest maritime cities of France and its medieval towers, gates, and streets, with its old city hall recall its days of glory. La Rochelle became a strong center of Protestantism, and resisted a six-months' siege after the Massacre of St. Bartholomew. In 1628 the town was attacked by Richelieu who built the dyke which still isolates it from the sea, and who entered the gates after a siege of eight months. La Rochelle is a considerable trading center and possesses varied industries. Pop. 1931, 45,043.

LARRETA, ENRIQUE RODRIGUEZ (1875-), Spanish-American author and diplomat, was born Mar. 4, 1875, in Buenos Aires, Argentina, of aristocratic lineage. He was educated in the Colegio Nacional and later studied law at the University. He married Dona Josefina Anchorena, like himself of an old Argentine family. From 1902 to 1905 Larreta served as Professor of History in the Colegio Nacional. From 1910 to 1916 he represented his country as Minister in Paris. He was a cosmopolite and a fruitful combination of the man of energy and the man of thought. His works, in Spanish and in French, are fairly numerous, and comprise verse, polemics, drama, political writings and fiction. It is by one of them alone, *La gloria de Don Ramiro,* written in 1908 and

since translated into 10 languages, that Larreta is probably destined to be remembered in the history of Argentine literature.

LARVA. In the life history of insects which have complete metamorphosis, that form which hatches from the egg is termed the larva. The immature stages of all insects were formerly called larvæ, but the term is now restricted to the meaning given above. Larvæ do not resemble the adult insects in form nor manner of life. The larval stage is one in which the insect feeds and stores much extra food in its body in the form of fat. Larvæ of moths and butterflies are caterpillars. Beetle larvæ are termed grubs. The term maggot is applied to fly larvæ.

LARVIK or **LAURVIK,** a port of Norway in the district of Vestfold on the Larviks Fjord and the railway Dammen-Skien, 98 mi. southwest of Oslo by rail. It has sulphur and mud-baths, lumber mills and docks. Industries include milling, shipping and trade and lumber and granite are exported. In the neighborhood is also Fritsoehus Castle, belonging to the Treschow family, one of the most magnificent estates in the north. Pop. 1930, 10,471.

LARYNGEAL TUBERCULOSIS: Treatment. *See also* LIGHT, ARTIFICIAL, IN TREATMENT OF DISEASE.

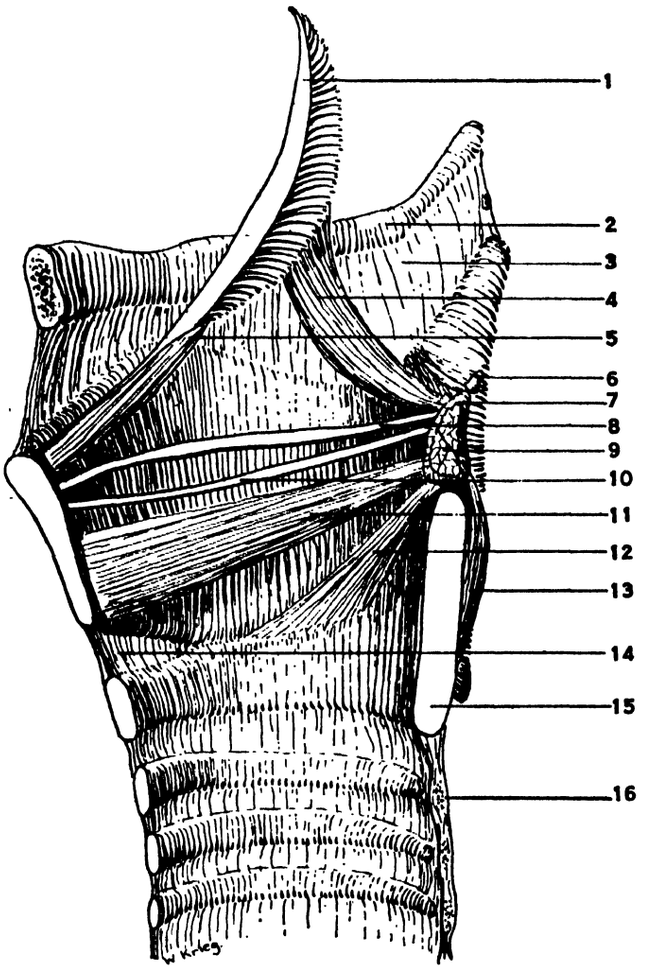
LARYNX, a portion of the upper end of the respiratory tract specialized for the production of voice. The Adam's Apple is the upper border of the larynx, The anatomy and action of the larynx is quite complex, but the entire structure is devised to enable the vocal cords, which by their vibration produce sound, to be approximated or separated. When close together they vibrate like the double reed of an oboe. When separated, the air can pass freely in and out of the lungs. The opening of the larynx is protected by a spatulate flap, the epiglottis (Figure, *Ep.*), which closes over it by reflex action whenever a food bolus approaches the entrance to the air passage, thus allowing it to pass into the esophagus behind it.

The larynx consists essentially of four cartilages: the thyroid cartilage (*Th.*), a horseshoe-shaped plate; the cricoid cartilage (*Cr.*), shaped like a signet ring, with the seal behind; and the paired arytenoid cartilages (*Ar.*), which are small triangular plates resting upon the back part of the cricoid cartilage. The vocal cords (*V.C.*) extend across the aperture of the larynx, between the arytenoid and thyroid cartilages.

The vocal cords are tightened by a muscle which tilts forward the thyroid cartilage, thus increasing the distance between the thyroid and arytenoid cartilages. They are rendered flaccid by contraction of a muscle which passes immediately alongside them, thereby shortening the distance between thyroid and arytenoid cartilages.

The modulation of sounds in speaking and singing is effected largely by altering the shape of the mouth and the relation of its parts. W. J. S. K.

LA SALE, ANTOINE DE (1388-1461), French satirist and novelist, was born, probably at Arles, in Provence, in 1388. In 1402 he was attached to the court of Anjou, serving as tutor to Jean, Duc de Calabrie. To Jean he dedicated *La Salade,* which contains an interesting account of an expedition to the Lake of Pilatos. In 1448 he became tutor to the



MID-SAGITTAL SECTION THROUGH HUMAN LARYNX WITH MOST OF THE SOFT STRUCTURES DISSECTED AWAY

1 E.p., *epiglottis;* 2 Hy., *hyoid bone;* 3 H.T., *hyo-thyroid membrane;* 4 A.E., *aryteno-epiglottideus;* 5 T.E., *thyreo-arytenoideus;* 6 Co., *corniculate cartilage;* 7 Ar., *arytenoid cartilage;* 8 F.V., *false vocal cord;* 9 A.M., *arytenoid muscle;* 10 V.C., *true vocal cord;* 11 T.A., *thyreo-arytenoideus;* 12 C.L., *crico-arytenoideus lateralis;* 13 C.P., *crico-arytenoideus posterior;* 14 M.C., *middle cricothyroid artery;* 15 Cr., *cricoid cartilage;* 16 Tr., *trachea*

three sons of Louis of Luxembourg. *Chronique du petit Jehan de Saintre* appeared in 1456. This work is a historical novel which sets forth, with the most abundant detail, the requisites for the complete education of the ideal knight of the epoch. La Sale died about 1461.

LA SALLE, SAINT JEAN BAPTIST DE (1651-1719), French priest and one of the founders of free universal education, was born at Rheims, Apr. 30, 1651. After being ordained a priest in 1678 he permanently organized in 1684 the order of the Brothers of the Christian Schools which was to bring education, especially vocational and technical, to the children of the poor. LaSalle laid down the principles of the "simultaneous" method of teaching as a rule of the institution, yet he was also successful in adapting the individual method. He recognized the value of the eye in teaching, and made much use of the

blackboard. He created a boarding college at Saint-Yon for secondary education, and opened one of the first normal schools for the training of teachers. La-Salle died at Saint-Yon, near Rouen, Apr. 7, 1719, and was canonized in 1900. His feast is celebrated May 15.

LA SALLE, RENÉ ROBERT CAVALIER, SIEUR DE (1643-87), French explorer, trader, and colonist of the Mississippi Valley, was born probably on Nov. 20, 1643. Son of a wealthy merchant of Rouen, he became a Jesuit novice. In 1666 he sailed to New France, where the Seminary of St. Sulpice granted him lands at the site of the modern Lachine on the St. Lawrence. Selling his seignory to obtain funds, from 1669 to 1671 he explored the regions south of lakes Erie and Ontario, reaching the Ohio River as the southern limit of his expedition. Going to France at the request of Frontenac, he was favorably received by Louis XIV, and in 1674 was made Seigneur of Frontenac. In 1677 he returned to France, on this visit obtaining the right to make explorations during the next five years, to build forts, and to control a monopoly in the fur trade.

On Nov. 18, 1678, his first real expedition embarked from Ft. Frontenac in the *Griffin,* the first vessel to engage in commerce on Lake Erie, and was met by the party led by his lieutenant, HENRI DE TONTI, at the Niagara River in the following January. At Green Bay, Wis., the *Griffin* put back with a cargo of furs for repaying La Salle's creditors, but disappeared completely. La Salle explored the west shore of Lake Michigan, and erected Ft. Miami at the mouth of the St. Joseph. By portage the expedition proceeded to the Illinois, and built Ft. Crevecoeur near Lake Peoria. At this point La Salle sent Père HENNEPIN to explore the upper Mississippi.

In the spring of 1681, having been refinanced through the exertions of Count Frontenac, La Salle started on his momentous exploration of the Mississippi. He had already insured the cooperation of the sectional Indian tribes against the Iroquois. Proceeding by way of his former route, he reached the Mississippi on Feb. 6, 1682, and by Apr. 6 he had found the delta. There he claimed all the region crossed in the name of France, and called it Louisiana.

La Salle returned to France in 1683. Louis XIV granted him four vessels and 400 men, so that La Salle might sail from France to the mouth of the Mississippi, and he was given permission to govern from the delta the lands between the Gulf of Mexico and Lake Michigan. Setting out in 1684, La Salle soon disagreed with Beaujeu, the naval commander; furthermore, he did not know the exact location of the delta. Confused by the numerous indentations along the coast of the gulf, he finally landed at Matagorda Bay in Texas, and camped on the Lavaca River, from which he hoped to reach the Mississippi overland. This proved a vain hope, and La Salle attempted to reach Canada in 1686-87. In the latter year, while leading his party, La Salle was killed by one of his own men.

LA SALLE, a city of La Salle Co., northern Illinois, situated about 50 mi. northeast of Peoria. Its location at the intersection of the Illinois and Vermilion rivers and at the terminus of the Illinois and Michigan Canal makes the city an important commercial center. Among its transportation facilities are the Illinois Central, the Burlington and the Rock Island railroads. The city's manufactures include clocks, zinc, acid and building blocks. In 1929 the manufactures were worth approximately $1,800,000; the retail trade amounted to $8,889,894. The vicinity has productive coal mines. Starved Rock State Park lies about 6 mi. east. La Salle was settled in 1830 and named after the famous explorer of this territory; the city charter dates from 1852. Pop. 1920, 13,050; 1930, 13,149.

LAS CASAS, BARTOLOME DE (1474-1566), Spanish historian, known as the "Apostle of the Indies" because of his work in behalf of the Indians. He was born in Seville of noble family and after finishing his studies went to Santo Domingo in 1502. In 1510 the first group of Dominican monks arrived in Santo Domingo, and Las Casas was influenced by their preaching to become a priest. Later he received an encomienda in Cuba, but in 1514 he began to reflect on the injustices done to the Indians, and, liberating his own Indians to Gov. Diego Columbus, he began to preach against the system of encomiendas. He had little success and determined to take his case before the crown. He went to Spain in 1515, and was granted an audience with the king. After the death of Ferdinand (1516), Cardinal Cisneros, the regent, gave him the title of universal procurator and protector of all the Indians, and named a commission to go to the New World to study conditions. The commission gave a report unfavorable to Las Casas's plan, and he returned to Spain in 1517.

In 1520 Charles V gave Las Casas a grant of land to be used for the welfare of the Indians, but the plan failed and he retired to Santo Domingo, where in 1523 he became a Dominican Friar. In 1531 he wrote a memorial for the Council of the Indies, asking for the freedom of the Indians, and went to Spain where he secured an order preventing the enslavement of Indians in Peru. He also obtained a grant to subdue the Indians of Tuzutlan and Coban in Guatemala. This he accomplished in two years without bloodshed. He secured the passage in 1542 of the New Laws of the Indies, which prohibited the enslavement of the Indians, and Charles V named him bishop of Chiapas. By 1544 the New Laws were repealed, and Las Casas again returned to Spain, where he lived the remainder of his life, writing and speaking in behalf of the Indians.

The influence of Las Casas on the literature of the history of Spain in America has been great. His histories were written to influence the Council of the Indies, and are highly exaggerated accounts of the cruelty to the Indians, but they have been quoted by historians since that time as authentic, and so have helped to create the belief that the Spaniards were

more cruel than the other colonizing nations. In spite of this defect, Las Casas still stands as one of the best sources for the history of Spain in America. His most important works are *Brevisima relacion de la destruycion de las Indias* and *Una historia general de las Indias.* B. W. D.

LAS CRUCES, an important city in southwestern New Mexico, the county seat of Dona Ana Co., situated on the Rio Grande River, 40 mi. northwest of El Paso. It is served by the Santa Fe Railroad. Las Cruces is a trade center in the Elephant Butte Dam irrigation region. The district has agricultural and fruit-growing interests. The city was settled in 1849; incorporated in 1907. Nearby is the seat and experimental station of the New Mexico College of Agriculture and Mechanical Arts. The adobe town of Mesilla, now a Mexican community, near the college, was once the capital of the Southwest Territory, and the scene of the sealing of the Gadsden Purchase, in 1854. On the east are the Organ Mountains, and to the southwest lava beds. The California Stage Coach Trail ran near Las Cruces. Pop. 1920, 3,969; 1930, 5,811.

LASHKAR, the New Town of the city of GWALIOR in the Gwalior State, Central India Agency, India. It was built immediately south of the Gwalior Fort early in the 19th century, and has grown rapidly. It is well laid out and contains the maharaja's palaces, Victoria College, a hospital and a museum. Lashkar was restored to the maharaja by the British in 1886. Pop., including Gwalior, 1921, 80,387; 1931, 86,758.

LAS PALMAS, a city of the Canary Islands, and capital of Grand Canary. It is situated on the banks of a small stream and is the largest city in the Canaries. It contains several fine buildings, including a cathedral, a theater and a museum. Though the city is Spanish, the trade is chiefly in the hands of the British and to them is due credit for the modern appearance and the lively commercial activity of Las Palmas. The principal exports are sugar, wine, fruits and vegetables. Textiles, timber, petroleum, cement, coal and iron are imported. Pop. 1928, 71,000.

LASSALLE, FERDINAND (1825-64), German socialist, was born at Breslau, Apr. 11, 1825. The son of a wealthy Jewish wholesale merchant, it was by choice rather than necessity that he identified himself with the working class. His brilliant career at the universities of Breslau and Berlin caused him to become known as *Das Wunderkind.* During Lassalle's university days his chief interests were in philosophy and philology; in fact his first book was *The Philosophy of Heraclitus the Obscure,* 1857. *The System of Acquired Rights,* 1861, was a notable legal treatise. But it was his championship of the Countess von Hatzfeldt in her fight for separation from her brutal husband that brought Lassalle before the public eye. From 1846-54 he fought this case, getting a hearing from 36 tribunals and finally securing a favorable verdict. His address before the Artisans' Association in Berlin, Apr. 12, 1862, on "The Workers' Program" has been designated as marking the birthday of German Social Democracy. Out of his activities grew the Universal Workingmen's Association, 1863, of which he was the recognized head. Lassalle was the champion of producers' associations and universal suffrage but is best remembered for having first given political organization to the labor movement. Out of his party grew the Social Democratic party of to-day. His spectacular career was cut short by a duel at Carouge, over a love affair, in which he was fatally wounded. He died Aug. 31, 1864.

LASSEN VOLCANIC NATIONAL PARK, in northeastern California, was created by act of Congress approved Aug. 9, 1916, and enlarged to its present area of 163 sq. mi. Jan. 19, 1929. Lassen Peak, elevation 10,453 ft., which stands at the southern end of the Cascade Mountains, is the only active volcano in the United States exclusive of Alaska and Hawaii. It is the sole survivor of what was once one of the largest areas of volcanic activity in the world. During the latter part of May 1914, after being quiet for 200 years, Lassen began a period of activity which had its climax on the night of May 19, 1915 and the afternoon of May 22, 1915 and lasted until Jan. 1916.

Interesting volcanic phenomena in the park include numerous boiling lakes, many-colored hot mud pots, boiling springs, steamers and incipient geysers. Of these, Boiling Springs Lake, a seething caldron, Devil's Kitchen, Willow Creek Geyser and the Pit are the most spectacular.

The park is reached by the Shasta Route of the Southern Pacific Railroad, the Western Pacific, and the Sacramento and Northern Electric. By automobile the park is accessible from Red Bluff on a spur of the National Park-to-Park Highway; also from Truckee, Calif., or Reno, Nev., on the Lincoln Highway. An extensive road system in the park was begun in 1924 which, when completed, will bring most of the major attractions within easy reach of the motorist.

LASSIK, a North American Indian tribe of the Coast division of the Athapascan linguistic stock. They formerly inhabited established villages in winter on part of the Eel River and its eastern branches in California, as well as the headwaters of the Mad River. Linguistically they were most closely related to the Hupa and Wailaki. Contact with whites caused their early depopulation so that only a few remnants live in their ancient habitation. They dwelt in conical, bark-covered houses, made twined basketry, were hunters, and in most of their customs resembled the neighboring Wintun with whom they intermarried.

LASSO, ORLANDO DI (known also by his Latin name Orlandus Lassus, but originally Roland Delattre, according to the belief of some scholars) (c. 1532-94), Netherlands music composer, was born at Mons about 1532. He was director of the choir of St. John Lateran, Rome, and between 1562 and 1587 served as capellmeister to Duke Albert V, and the latter's son, Duke William, of Bavaria. The last of the great

Netherlands composers, he has been favorably compared with his great Italian contemporary PALESTRINA. The most noted of his compositions are the *Psalmi Davidis Poenitentiales* and the *Missa pro Defunctus*. His works included more than 1,000 motets, 200 madrigals, and numerous masses. Among composers of the 16th century he occupies a high position by reason both of his melodic graciousness and harmonic fluency. Orlando di Lasso died at Munich, June 14, 1594.

LAST DAYS OF POMPEII, THE, a novel by EDWARD GEORGE BULWER-LYTTON; published 1834. It deals with life in Pompeii just before and during the time of its destruction by Vesuvius, 79 A.D. The story proper tells of two lovers, Glaucus and Ione, who are saved from the burning city by a blind flower-girl, Nydia, become Christians and escape to Greece. The book's great value, however, depends upon its vivid and detailed pictures of Pompeian life, the result of the author's first-hand study of the famous city.

LAS VEGAS, a city in southeastern Nevada, the county seat of Clark Co., situated near the Colorado River, 225 mi. southeast of Tonopah. Airplanes, bus lines and the Union Pacific Railroad afford transportation. Las Vegas is in the midst of a rich mining region, producing gold, lead, zinc, gypsum and other minerals. The countryside is irrigated by artesian wells; farming and fruit-growing are carried on extensively. The city has railroad shops and gypsum works. Southeast, on the Colorado River, is Black Canyon, the site of the enormous Hoover Dam, which will help in preventing floods, in irrigating and in generating power. Near by is the Old Fort, recalling the struggle between the pioneers and the Indians. Gypsum Cave, of interest to science, and Fire Valley, with its brilliant coloring, are in the vicinity. Las Vegas was founded in 1905; incorporated in 1911. Pop. 1920, 2,304; 1930, 5,165.

LAS VEGAS, a city in northeastern New Mexico, the county seat of San Miguel Co., situated on the Gallinas River, 45 mi. southeast of Santa Fé on the historic Santa Fé trail and is served by the Santa Fé Railroad. The city is a division headquarters for the railroad, which maintains repair shops. It is a market and transportation point for wool, fur, hides, cattle and sheep, and a supply center for the irrigated agricultural district, and a wide extent of range country. Las Vegas is the seat of the State Normal University. A short distance away are the celebrated Las Vegas hot springs and baths. Opposite the modern city on the west bank of the river is the Mexican town of Las Vegas with the old court-house. The old town was settled in 1840. The present city was incorporated in 1895. Las Vegas has an elevation of 6,384 ft. Pop. 1920, 4,304; 1930, 4,719.

LATAKIA, a city of Syria, located across from the island of Cyprus, about 75 mi. north of Tripoli. Once called Ramitha by the Phoenicians, and later Laodicea, Latakia was taken by the Romans and renamed Julia. Many evidences of Roman civilization exist in the town, among which is a triumphant arch believed to date from the time of Septimus Severus. An American Mission is located in Latakia. In the Middle Ages a busy seaport, Latakia now owes its prosperity primarily to the Latakia tobacco of the district, which is sold to Europe and Africa. Eggs, sponges and silks are also exported. Pop. 1929, 21,404.

LATEEN. *See* RIGGING.

LATENT HEAT. In general, whenever a substance undergoes a change in state, HEAT is either absorbed or liberated, although no change in temperature occurs. The *latent heat of fusion* of a solid is defined as the amount of heat required to change a unit mass of it, at the melting point, to the liquid state, without change in temperature. Similarly, the *latent heat of vaporization* is the amount of heat required to convert a unit mass of a liquid to vapor without change in temperature. Thus, when ice at 0° C. changes to water at 0° C., heat is absorbed at the rate of 80 CALORIES per gram of ice melted. When a gram of water at 100° C. is converted into steam at 100° C., 539 calories of heat are absorbed. Conversely, if one gram of steam at 100° C. condenses to water at 100° C., 539 calories are liberated. Thus, the latent heat of fusion of ice is 80 calories per gram and the latent heat of vaporization of water at 100° C. is 539 calories per gram.

Other changes sometimes occur in substances which involve molecular rearrangement without change in state. Any such change which involves an alteration in the internal energy of the body is accompanied by an absorption or a liberation of heat, and therefore has an appropriate latent heat associated with it.

The term "latent heat" is a relic of the old CALORIC theory in which it stood as the antithesis of "sensible heat," i.e., heat associated with change in temperature. Hence, modern authors often speak of "heat of fusion" or "heat of vaporization" without the qualifying adjective. W. W. S.

LATERAN COUNCILS, THE, receive the name from the Lateran Palace at Rome in which they were held. Though many assemblies met here the Lateran councils are reckoned as five. They are regarded as ecumenical by the Roman Church.

The first Lateran council confirmed the CONCORDAT OF WORMS and upheld the Hildebrandian campaign for clerical celibacy.

The second Lateran council met at the close of the papal schism between Innocent II and Anacletus II. On the death of his rival Innocent called the council to depose all those who had supported his opponent. The council also legislated against sexual offenses, against dangerous tournaments, and concerning the TRUCE OF GOD.

The third Lateran council met under Alexander III again to regulate the affairs of the church after a schism. The legislation once more dealt with sexual offenses, tournaments, the Truce of God, as well as with asylums for lepers, the privileges of the Templars and Hospitallers and the election of the pope, which must be by a two-thirds majority of the cardinals.

The fourth Lateran council, convened by Innocent

III, is one of the greatest assemblies of the church, a symbol of the religious and cultural unity of the Middle Ages. All of the powers, lay as well as ecclesiastical, were represented. The council brought to a culmination the medieval doctrine of the Eucharist and made TRANSUBSTANTIATION the official doctrine of the church. The penitential system also received formulation, in that confession to a priest was made obligatory at least once a year. Previous regulations for an episcopal inquisition against heresy were repeated, and a suspect who did not clear himself within a year was declared condemned, but a clerk was not to give judgment of blood nor witness an execution. To curb financial and disciplinary abuses it was decreed that relics should not be taken from the churches, and that the penance released by one episcopal privilege should not exceed a year. The prohibition of new monastic orders was ineffective, since the Franciscans and Dominicans arose in this very period. A new crusade was set for June 1st, 1227.

The fifth Lateran council was convened by Julius II as a counterpart to a schismatic assembly at Pisa. The Lateran council, which continued under Leo X, revoked the PRAGMATIC SANCTION of Bourges and made a new concordat with Francis I, regulated the censorship of books, and levied a tithe for war against the Turks.

LATERAN TREATY, Feb. 11, 1929, a treaty between the Italian Government and the Pope to settle the boundaries of the STATE OF VATICAN CITY.

LATERITE, a red soil typical of tropical regions which results from the WEATHERING of various rocks, especially granite. Little remains of the rock save a cellular mass of quartz sand, mixed with a clay, and colored red by oxides of iron. It may on occasion be rich enough in such oxides to serve as an ORE of iron.

LATEX, a milky fluid occurring in many plants, particularly those of the milkweed, dogbane, spurge and mulberry families, in special (*laticiferous*) vessels or cells. It is usually white in color, though sometimes yellow or orange, and generally contains small amounts of sugar, gum resin, fats, wax, acids and alkaloids. Various products of economic importance are obtained from latex, among them India rubber, gutta-percha, balata, getah-jelutong (Pontianak rubber) and opium.

LATHES, cutting machines, usually horizontal, in which the work is revolved in a suitable holder or CHUCK, while tools of various kinds, fed against the work, turn or bore it to the shapes desired. When equipped with a lead screw so that SCREW THREADS can be cut, they are called "engine" lathes, although this is a misnomer at present. Lathes are equipped with many devices for holding both tools and work, and they are classified according to their design. They are also built to perform certain operations either wholly or partly automatically. Lathes in which the operator is required to put the work in place and start the machine, all operations from this point on being automatic, are known as semi-automatic lathes. Lathes which also feed the work and require no attention are called full-automatics, or simply automatics. *See* AUTOMATIC MACHINERY. Many lathes of this type are known as screw machines, largely because they were originally built to machine screws, or because this is a large part of their product. *See also* MACHINE TOOLS.

LATHROP, JULIA CLIFFORD (1858-1932), American publicist and humanitarian, was born at Rockford, Ill., in 1858, and educated at Rockford and Vassar colleges. An active worker in various reform movements, she interested herself particularly in child welfare, juvenile court work, and care of the insane, investigated activities in America and Europe, and wrote numerous articles and reports on these subjects. From 1899 on she spent much time as volunteer resident at Hull House, Chicago. Except for a four-year period, she was a member of the Illinois State Board of Charities between 1893 and 1909, and with the establishment of the Federal Children's Bureau in 1912 was appointed its first chief, retiring in 1921 from that capacity. In 1925 she was made assessor of the Child Welfare Committee of the LEAGUE OF NATIONS, and has attended the meetings of the committee since that year, except in 1928. In 1929 at the conference on child health and protection called by President Hoover she was a leading spirit. Miss Lathrop died at Rockford, Ill., Apr. 15, 1932.

LATIMER, HUGH (1490?-1555), English cleric and ecclesiastical reformer, was born between 1485 and 1490, at Thurcaston, Leicestershire. He graduated at Cambridge University in 1510, subsequently took orders, and became noted for his opposition to existing evils as well as for his eloquence. He espoused the Reformation and supported Henry VIII to whom he wrote a celebrated letter concerning the value of circulating the Bible widely and freely. With Cranmer and Cromwell, he was one of the chief advisors of the king after Henry had thrown off the authority of the pope, helping to draw up much of the legislation necessitated by that act. In 1535 he was made bishop of Worcester, but resigned in 1539, being deceived as to the wishes of Henry. On a visit to London he was imprisoned in the Tower by the leaders of the party that stood for reaction, but he was released on the accession of Edward VI. When Mary became Queen he was again thrown into prison, where he remained for upwards of a year, being finally condemned. He was burned at the stake Oct. 16, 1555. His famous words to Bishop Ridley, his fellow martyr, have always singled him out as a noble man: "Be of good cheer, Master Ridley, and play the man; we shall this day light such a candle by God's grace in England as (I trust) shall never be put out."

LATIN AMERICA. It is intended in this article to offer a synthesis of those developments and problems which are common to the Latin American nations. The articles devoted to the various nations take

up, in more or less detail, the geography and the historical and economic evolution of each, stressing their peculiar and individual phases. In this article the colonial heritage, the politics, the racial problems and the international relations of the Latin American nations will be discussed. It should be stated at the outset that no generalization is applicable to all Latin America. The terms Latin America, Ibero America and Hispanic America are inappropriate and misleading since they imply the existence of a great nationality which is Latin in origin and culture. There are 20 nations in Latin America and each in a very real sense possesses a culture of its own. In Central America there are Guatemala, Honduras, Nicaragua, El Salvador and Costa Rica. Two others rarely classified with the Central American group but belonging there more properly than elsewhere are Mexico and Panama. The West Indian republics are Cuba, Santo Domingo and Haiti. In South America are found: Colombia, Venezuela, Ecuador, Peru, Bolivia, Chile, Argentina, Uruguay, Paraguay and Brazil.

Colonial Systems of Administration. The principles underlying Spanish and Portuguese colonial government were essentially the same. America was governed according to the tenets of the politico-economic theory of mercantilism. This implied the exclusive, monopolistic and paternalistic rule of the colonies for the benefit of the monarchs to whom the colonies belonged as portions of their personal patrimony. The great ally of their Catholic Majesties was the Church, which was mainly responsible for the civilization and Christianization of the Indians as well as for what education was provided for the colonists. The economic policy was illiberal. None but Iberians could trade with the colonists and even then under controlled and stifling restrictions. None but Iberians were appointed to responsible posts. Nearly all the viceroys, captains-general and presidents presiding over territorial subdivisions of the Spanish colonial empire bearing the names from which their titles were derived were peninsular Spaniards, and as a rule only Spaniards were appointed as judges to the *audiencias,* the highest courts of justice in Spain's colonies. The *corregidores* in charge of Indian communities were also Spaniards or Creoles appointed by the monarch. The Indians, gathered together in towns and villages, were parcelled out as *encomiendas,* and in return for their tribute the *encomendero* was instructed to protect, educate and Christianize his Indians. The large estates were kept intact and were transmitted to the eldest son. The younger sons and all Creoles who sought dignified outlets for their energies were restricted to the practice of law, to the militias or subordinate positions in the Spanish army or Church. All Spaniards born in the New World were known as Creoles. They were loyal Americans and drawn together by the discrimination against them by the mother countries. The Portuguese system was very similar to that of Spain.

Races. Latin America is more than a laboratory of race mixture; it is a melting pot of distinct civilizations. The European (white), representing a medieval civilization when he arrived in the New World, conquered the red man living in a world more ancient than medieval. The Indian's civilization had some of the greatness of the older and more classical cultures of antiquity. The black man was brought from Africa in a culture stage that was primitive in some respects though in others far more developed than is usually thought to be the case. Not only three races met and married but three cultures were woven together. From this intermarriage the dominant racial element of Latin America to-day is emerging. In a few states, like Mexico, the *mestizo* is already the leader in society, politics, art and religion. He is perfectly accustomed and acclimated to the conditions of the New World and is essentially an American in outlook and loyalties. Interesting are the social classes resulting from the miscegenation of the three races. Each country has its lower classes whose customs, costumes, speech, lore and trade are picturesque and distinctive, such as the *llanero* of Venezuela, the *gaucho* of Argentina, the *peon* of Mexico, the *roto* of Chile and the *sertanejo, matuto* and *caipira* of Brazil.

Of the three races, the pure Iberian, who brought the law, language and religion of Europe to America, is still the dominant element, politically and socially, in most of the South American states. In countries like Brazil and Argentina there has been a strong infiltration of other European stocks through immigration. According to Roquette Pinto, the Brazilian anthropologist, the Negro is now like an actor who, as a hand on the sugar plantations and cattle ranches or as a domestic servant or nurse, has played his great role and is putting on his coat and hat preparatory to passing off the stage. Though there are millions of Negroes in Brazil and the Caribbean their number is diminishing. The third race, the Indian or Amerindian, still exists in large numbers and in some countries constitutes the majority or a large proportion of the population. Such is the case in Bolivia, Ecuador, Peru and Mexico, where there are serious racial problems of a social, economic and political nature. In Bolivia the Indian forms 80% of the population. He is ignorant and in many districts quite uncivilized. Many of these Indians have become increasingly conscious of their lost heritage and privileges and are growing more and more restive under their present masters.

Time, says Ernest Gruening in *Mexico and its Heritage,* is the transcendental problem in Mexico. He refers to the time difference in the culture stages reached by the millions of Mexicans, the Indians and the dominant Spanish or *mestizo* governing group, the latter representing modern society and the former a pre-Colombian stage of evolution. An Indianistic policy is being carried out in Mexico today with remarkable results. The aim is to lessen the gap between the two races by drawing the Spanish culture more and more into the Indian and by giving the Indians land.

Latin American Politics, Heritage. The colonial system of administration was not contrived to give the Latin American colonists experience in self-government. The *cabildos,* the town governments where they had been able to practice self-government to a certain degree in the 16th century, in the course of time lost their popular and democratic character. It must not be assumed, however, that the political philosophy of 18th century France and the political ideals and institutions of the United States were unknown. The early efforts at political organization reveal clearly that the creoles had a theoretical knowledge of principles of government and very pronounced ideas on constitutional matters. The vast majority of the people were illiterate. Those that were not belonged to three groups, the clergy, the military and the landowning aristocracy. These three, however, all belonged to the conservative group for reasons already mentioned—their economic interests were almost identical since they were all related to the landed proprietors. A complicating factor, moreover, was the organization of society around influential individuals. Espinosa Tamayo states that all Ecuadorians at the time of independence were related by ties of one sort or another to five families. Thus the head of a family might mobilize a vast army not only to defend his economic interests but to promote his political ambitions if he so desired. The early life of Latin America must be thought of in the terms of persons. They were individualists and thought of all else in the terms of personalities. Political principles paled into insignificance when great men were in the arena.

Military Caudillos and Presidential Dictators. It was natural that in a society so organized the military heroes of the wars of independence should become the most powerful political force. In practically every case, the liberators, or their higher officers became the presidents or supreme directors of the countries they had liberated. That they should rely on their armies for support was natural and it was still more natural that they should be suspicious of democratic practices. Once grounded by military force, by force only could they be ousted. Thus it is not strange that the first 40 or 50 years of most of the Latin American nations should be characterized by the rise and fall of military *caudillos.*

Some of the early presidents, however, were civilians, although their method of getting into and retaining power was sometimes similar to that of the military *caudillo.* Many of them moreover devoted considerable attention to promoting national prosperity along economic lines and in some cases by progressive measures in the moral and educational fields. Their term of office was often stretched to 10 or 20 years by ingenious devices. The great work of some of these Presidential dictators was to unify their countries, give them peace and stability and prepare the way for a true constitutional regime.

Presidents have succeeded one another in constitutional fashion in many of the countries for a number of years and the tendency in normal times is for their number to increase. The old arbitrary type of personal government is bound to yield to real popular government.

Constitutions. The frequent changes in constitutions in the Latin American countries have often been referred to as proof of political instability and ignorance, but the record of any one of the Latin American countries does not compare unfavorably with that of older and more experienced nations. In many cases it was the idealism of the Latin Americans which led them in the early days to adopt a form of government not suitable to their ethnic, social and economic conditions and later a marked sense of realism and courage that led them to change the fundamental charters when they failed to provide efficient governments. Many changes were brought about by dictators whose purpose was to adapt the constitutions to forms of government they had already introduced or to cloak with legality their own method of procedure. Four countries have had only two or three constitutions since the third decade of the 19th century. These are, with the dates of their first and latest constitutions: Chile, 1833 and 1925; Uruguay, 1829 and 1919; Brazil, 1824 and 1891 and Argentina, 1819, 1826 and 1853. Some of the others like Venezuela have had 15 or more. In most countries constitutional changes since 1917 have introduced liberal ideas and novel experiments. The revised Uruguayan constitution of 1919 created a collegiate executive in order to lessen the attractiveness of that office to a single individual. The constitutions of 1917 in Mexico, of 1919 in Peru, and of 1928 in Ecuador have distinct socialistic tendencies and have been supplemented by social legislation of a most liberal type. Others have similar innovations.

Revolutions. It must be clear that for the opposition to win an election was virtually out of the question with the presidents established by military force and where the impeachment of executives and cabinet officers was practically impossible because the two impeaching powers, legislative and judiciary, were filled with the friends and retainers of the executive. No legal or peaceful means could ameliorate the situation. If the executive controlled effectively the armed forces a revolution could not succeed. If the military and naval forces, however, showed independent judgment, as has been the case in many countries, the people might enlist their support. And what has often appeared to the world as mere lack of discipline has been in reality an idealistic and unselfish movement of the officers and troops in behalf of popular rights and liberties. The armed uprisings of recent years have indicated that the military have developed in many cases a social conscience. Many of the successful generals have handed the government over to civilian officials as soon as was practicable or submitted to election or defeat at the polls. The earlier revolutions were no doubt often led by ambitious individuals or defeated candidates who wished to put themselves in power at any cost, and this sort, frequent in the more backward countries, has been

exploited by the press, cartoonists, humorists and novelists as typical manifestations of Latin American politics. But the opera bouffe type of revolution is a thing of the past. It can never return because the Latin American nations have all been plunged, since the World War, into the very heart of a civilized world where such rebellions are considered neither proper nor expedient. The recognition policy adopted by the United States in conformity with the Central American treaties of 1923 has lessened unreasonable revolts in that part of the world where they were endemic.

Political Parties. One of the results of *personalismo* in action has been to retard the development of formal political parties. Ephemeral parties have existed for or against certain philosophies and principles but these in most cases were composed of individuals following a leader. Such have been the Federalists and Unitarians, the clericals and anti-clericals, the civilians and militarists, and the Liberals and Conservatives, even in countries where these parties have had a nominal existence for decades. Even today most of the electoral campaigns center around personalities rather than principles. Another reason for the absence of parties with distinct platforms and policies is the absence of sectional economic difference. There are no countries with an industrial group whose interests are antithetical to those of an agricultural population. One of the recent tendencies has been to form national parties, that is, parties with a nationalist program, nationalist being understood in a Latin American sense. This means a process of nationalizing all the natural resources, industries and institutions of the nation, the lessening of the influence of foreigners and their money and the election of governments which represent national rather than local, party or personal interests. National welfare is to supersede all other considerations.

Economic Life. Landed Estates. The economic factors with social and political implications of most importance are, first, the existence of large landed estates, and second, the reliance of most of the nations upon one major commercial product. The first of these created a small but extremely wealthy aristocracy who exploited the Indians and lower classes and most of the land. Conservative in politics and religion and controlling the reins of power, their major concern in the last hundred years has been to maintain their own supremacy.

The second factor has been the cause of the great political and economic ups and downs of the Latin American nations. All their eggs are in one basket. Brazil relies almost entirely on coffee; Bolivia on tin; Argentina on wheat and cattle products; Uruguay on meats; the Central American republics on bananas and coffee; Cuba on sugar and Mexico and Venezuela on oil. These are all products whose prices depend on a prosperous world market and the ones from which are derived the bulk of the governmental revenues. Therefore when a major economic crisis such as that beginning in 1929 depresses the prices of these commodities to below the cost of production and when the foreign markets cease to absorb them economic disaster is always threatened. Interest payments are suspended and the whole economic life of the nation involved is adversely affected. Unrest, social disturbances and political revolutions are often the result. Efforts are being made to diversify production and to reduce the evils which come from too great a reliance on one key product. Efforts to control the prices by governmental action have proved abortive. The valorization schemes of the Brazilian government have not prevented a drop in the price of coffee. The plight of Cuba is another example of the dangers accruing from dependence on one product, sugar, for economic welfare. The question of foreign loans is discussed in the section on the relations of the Latin American republics with the United States.

Industrialization. In the last 50 years industrial plants, and modern transportation systems and means of communicating thought have been introduced. These have created new economic classes and new political problems. In some countries the railroad stage of development is being skipped altogether. Transportation is being supplied by automotive power. This has led to extensive programs of road building. The airplane and air travel are other innovations which have been introduced with marked success throughout all Latin America. Airmail connections with Europe and the United States and among the Latin American countries themselves have speeded up this form of communication. The Latin American nations have achieved commanding positions in the economic life of the world. They are virtually supreme in the sugar, coffee and tin markets. They are competing seriously with the leaders in the copper, wheat, meat, oil and nitrate markets. They are among the best customers of the manufacturing countries and have been a profitable field for investment. There is a strong competition between the nations of Europe and those of North America for their trade. The former lost their dominating position to the latter in the course of the World War, but the impressive recovery of the lost ground on the part of the Europeans bids for a continuation of the struggle.

INTERNATIONAL RELATIONS

Inter-Latin American Relations. As in the colonial period, the Latin American nations have not had many peacetime contacts with each other. Their commercial and economic interests are with the United States or with European nations. The most prolific source of conflicts has been boundary disputes. None of the nations have escaped the necessity of determining with their various neighbors, in cooperation or in conflict, the territorial extent of their domains. Though the majority of cases have been settled by arbitration, a policy actively fostered by the Latin American nations as a means of settling international disputes, some wars have resulted. In other cases tense moments have occurred when war seemed immi-

nent. The two most serious wars took place in South America, although a chronic state of warfare obtained in Central America throughout the 19th and early 20th centuries. The PARAGUAYAN WAR, 1865-70, was caused by the overreaching ambitions of Francisco Solano Lopez, dictator of Paraguay, together with certain phases of the internal politics of Uruguay in which Brazil and Paraguay had become involved. Argentina was drawn into the Tripartite Alliance, Brazil, Uruguay and Argentina, when President Mitre of Argentina refused to allow Lopez's troops to pass through Argentine territory. The navigation of the Paraguay River was also a factor. The war was a long drawn-out struggle in which the Paraguayans were decimated, and they have only recently begun to recover from its disastrous effects. Lopez was killed in 1870 and Paraguay lost considerable territory to Argentina and Brazil.

War of Pacific. The War of the Pacific between Chile on the one hand and Peru and Bolivia on the other was the most serious in its aftermath. It lasted from 1879 to 1883, although the territorial settlement was only reached in 1929. The difficulty arose over the exploitation by Chile, with Bolivian permission, of the nitrate deposits of Atacama on the Bolivian coast. Bolivia, which had formed a secret alliance with Peru, sought to increase the tax on the nitrates exported by the Chilean companies. Other factors were involved but the result was that Chile declared war on both powers and defeated them after having occupied Lima, the capital of Peru. By the Treaty of Ancon, 1884, Chile was ceded the province of Tarapacá outright and was given the provinces of Tacna and Arica for 10 years, at the end of which period a plebiscite in these provinces was to determine their definite status. Bolivia, at first temporarily then definitely, ceded Atacama to Chile and thereby lost its outlet to the sea. The plebiscite, however, was not held according to the treaty of Ancon, and this gave rise to the Question of the Pacific. The fate of the provinces became a bone of contention between Chile and Peru. They broke off diplomatic relations and were several times at the point of war. The Chileanization of the provinces seemed to preclude a fair vote and the Peruvians rejected the plebiscite as a means of settling the problem. In 1922 President Harding was asked to arbitrate. President Coolidge, who inherited the problem, decided on a plebiscite, but Generals J. J. Pershing and William Lassiter failed in their attempt to hold one. In 1929 by direct negotiation Chile and Peru solved the question, Peru receiving Tacna, and Chile, Arica. Chile furthermore agreed to pay $6,000,000 to Peru and fulfill certain other minor obligations. It is impossible to make more than a mention of Latin American attempts at forming confederations and at solving common problems by the conference method. All the confederations have failed, notably those in Central America, where the centrifugal forces disrupted a Central American Court of Justice. Conferences have been held at one time or another since Bolivar's Congress of Panama in 1826, at Lima, Santiago and Montevideo but none of them brought any tangible results. In 1931, as a result of the economic depression, conferences were held at Lima and Montevideo to discuss cooperative efforts looking to a solution of financial and commercial difficulties. In spite of the failure of confederations, conferences and courts, the Latin Americans have cherished the dream of a great cooperative effort to solve their common problems. Pan Hispanism is based on the community of language, religion and culture of the Latin American peoples, and suggests that common economic, political and diplomatic problems can better be solved by common action or by the exchange of experiences. In one branch of this movement Spain is the prime mover and in another, well known Latin Americans, such as Manuel Ugarte, the author of *The Destiny of a Continent,* are the mainsprings of inspiration. A movement fostered by France, Pan Latinism, is more inclusive and seeks to mobilize the common sympathies and actions of all nations of romance tongues. In Latin America itself one of the principal causes for keeping such a movement alive is the fear of the Colossus of the North, as the United States is called. Brazil, the sole representative of Portuguese culture in America, the largest nation in Latin America and the one which has grown territorially at the expense of all its South American neighbors with the exception of Chile occupies a rather awkward position amongst its Spanish speaking neighbors. The struggle for the leadership in any movement of the sort lets loose nationalistic aspirations which weaken its unity and therefore its primary aim.

Relations of Latin America with Europe. In the 19th and first 15 years of the 20th centuries, the relations of European nations with those of Latin America have been primarily cultural and economic. France is considered by many the intellectual Mother of the Latin Americans. Her liberal philosophy and literature have had profound influence in Latin American intellectual circles. England contributed not only many ideas of a political and economic nature, but investments to carry these ideas into practice. Since the 19th century, Great Britain has had by far the largest investments in that part of the world. France and Germany followed and carried on as did England a large trade with the Latin American nations. Despite the Monroe Doctrine and the peacefulness of Latin American relations with Europe in general, England, France and Spain on more than one occasion have blockaded, invaded or attacked Latin American ports and capitals. England in 1833 occupied and has since kept the Falkland Islands to which the Argentines laid claim. During the Civil War in the United States Spain sought to reconquer some of her former colonies by specious pretexts and France set an Austrian prince on a Mexican throne. In general, however, these nations have resorted to arbitration to settle their disputes which have arisen from boundary questions, from claims of citizens against governments for damages

received in revolutions and from the problems created by loans and foreign investments in the Latin American republics. In 1902 several European nations undertook to collect by force payments due from Venezuela. This evoked not only protests from the United States but the Drago doctrine on the forcible collection of debts, based upon that expressed by the Argentine publicist Carlos Calvo 20 years before. In 1907 most of the Latin American nations were represented at the Second Hague Convention.

World War. In 1914, when the World War broke out, all of the Latin American republics remained neutral until the United States joined in 1917. Eight countries followed her lead and declared war on Germany—Cuba, Panama, Haiti, Costa Rica, Honduras, Guatemala and Brazil. Five severed diplomatic relations, Bolivia, Ecuador, Peru, Uruguay and the Dominican Republic; and the other seven remained neutral. Among the latter the most important were Argentina, Chile and Mexico. At the Versailles Peace Conference many of the Latin American nations were represented.

League of Nations. The following Latin American nations became original members of the League of Nations: Bolivia, Brazil, Cuba, Guatemala, Haiti, Honduras, Nicaragua, Panama, Peru and Uruguay. Subsequently these also joined: Argentina, Chile, Colombia, Costa Rica, Paraguay, Salvador and Venezuela. The Dominican Republic and Mexico are also members, having entered in 1924 and 1931, respectively. Ecuador is the only country of Latin America which has never joined. Others have withdrawn or given notice of intention to withdraw and in some cases have reentered.

Relations with the United States. Though Great Britain did more to assist the Latin Americans to win their freedom, the United States was the first to recognize their independence. This country also issued on Dec. 2, 1823, what has come to be known as the Monroe Doctrine, a statement warning Europeans that their interventions in the New World would be unwelcome. This doctrine, with its many corollaries, has become in Latin America one of the chief obstacles to friendly relations. The Latin Americans see in it a cloak for the imperialistic activities of the United States. They refer to the Mexican War, 1846-48, to the "stealing" of the Panama Canal, and to the interventions in the Central American and West Indian republics as evidence that the United States has designs, economic and political, on their territory. The Spanish American War, ostensibly to free Cuba, did little to allay suspicions. The retention of Porto Rico and the Platt Amendment have caused no little acrimonious feeling amongst Latin Americans against the United States. Furthermore, the maintenance of Marines in Nicaragua, the control of customs and the establishment of virtual protectorates over West Indian and Central American republics have nullified to a great extent the good will expressed by American Presidents, Secretaries of State and prominent men in academic and business life. The Hoover Administration made a valiant effort to improve the relations between the Americas. The President when elected to office made a good-will tour of Latin America. He caused to be published a statement on the Monroe Doctrine and began a recall of the Marines from Haiti and Nicaragua, but the tariff passed in his administration has more than offset in some instances what friendly advance had been made.

Pan Americanism. Ever since the secretaryship of James G. Blaine in the State Department, the United States government has taken the lead in what is known as the Pan American movement. To capitalize the common isolation of all the American nations from Europe and Asia, their common republican institutions and the complementary character of their economic life, the United States has called into being what is known as the Pan American Union. The first congress to give substance to this idea was held in 1889 in Washington. Five Congresses have been held in various Latin American capitals in which: compulsory arbitration; standardization of weights, measures, coins, and consular procedure; transportation, shipping, roads, railways and airways; trade and banking practice, etc., etc., have been discussed. Similar congresses of American jurists, educators and scientists have sought to put Pan Americanism into practice. The center of the movement is the beautiful building given by Andrew Carnegie in Washington. The main functions of the Pan American Union in Washington are to disseminate information regarding the American republics, to serve as an office of record for inter-American treaties, and as a permanent commission sitting between the International Conferences of American States. Its publications appear in Spanish, Portuguese, French and English. The Union has no political powers. The Latin Americans have supported it enthusiastically at times and opposed it at others. Considerations of trade are given by them as the prime interest of the North Americans in promoting Pan Americanism.

United States Investments in Latin America. Since 1914 the economic interests of the United States in Latin America, especially in the South American republics, have grown in amazing fashion, except in Mexico and Cuba where United States interests are of long standing. Its trade superseded that of Europe during the war and its investments have assumed huge proportions. More than five billions of American dollars are invested in Latin American enterprise and government financing. Much of this found its way South in the period between 1920 and 1929. The United States lent in this short period to South American governments a sum larger than Great Britain had invested in a period of 50 years or more. The inexperience of American bankers, the unpreparedness or unsound financing of Latin American governments and the economic depression of 1929 caused many of the Latin American nations to go into default. They had over-borrowed in some cases, in others their too great reliance on one product whose

price and sale had declined made it impossible for them to meet their obligations.

Though the economic stake of the United States is enormous and its trade with Latin America of great proportions the cultural relationships are relatively slight. People in both continents are crassly ignorant of each other. Until recently the means of communication between the two were inferior to those between them and Europe. During and just after the war many Latin American students who otherwise would have gone to Europe came to the United States. In more recent times they are returning to Europe again. With the establishment of American owned and operated steamship lines and airplane service, travel to and from Latin America is increasing. There are many organizations seeking to foster better relationships between the Americas. In spite of the obstacles some progress has been achieved. Political and economic instability in Latin America, American provincialism and complacency are the main barriers to more fruitful intercourse between the American nations. Their economic interests are in general complementary, the one producing raw materials and foods and the other manufactured goods. Nationalism is, however, just as strong an emotion in America as it is in Europe and national considerations supersede all others in times of crisis. The tremendous disparity in the size and power of the United States, and its real or alleged economic and strategic needs are not considerate of the needs and ambitions of smaller nations. The Latin Americans are aware of this and fear the Yankee Peril. P. V. S.

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LATIN-AMERICAN LITERATURE includes the literary productions of the nations that grew out of the Spanish and Portuguese colonies in the Americas. Portuguese, naturally modified by the new-world environment, is the cultural idiom of Brazil; the rest of Latin-America (a term that has not been allowed to pass unchallenged) employs a similarly modified Spanish. The evolution of belles lettres in Spanish- and Portuguese-America has followed, often in parallel lines, the social, political and economic fortunes of the various domains. The Colonial period stands forth well-defined as a long era of imitation, adaptation and emergent nativism. It was the epoch of reportorial documents, *cartas de relación,* geographical descriptions, histories, and was concerned with the natives, the conquest, and with theological and political domination.

Toward the end of this extended and generally arid period, under the influence of the United States and France there were revolutionary rumblings. The cultural influence of the respective homelands declined; Romanticism, which always involves the assertion of personal and national autonomy, was just below the horizon, ready to burst into the flames of dawn when, after 14 years of struggle, 1810-24, the South American vice-royalties split into a continental cluster of republics. Brazil achieved independence bloodlessly in 1822, and the Empire lasted until 1889, when the Republican period began. After these successes, the epoch of independence was inaugurated. The incipient nativism of the Conquest became a self-glorifying nationalism that, in some inspired poets, broadened into continentalism. The ideal of Bolívar, a *Magna Patria,* found its reflection in letters. There was a historic moment of violent hatred for the mother countries that found expression in sentimental democracy; the native Indian became the symbol of the free man.

From then on, the republics shook off forever the intellectual and spiritual colonialism which had been the cultural aspect of their dependency. They followed and sometimes blended with the currents of European thought, especially as filtered through Paris. Thus rescued from the doldrums of Castilian and Portuguese academicism, classicism and romanticism, they advanced steadily toward a broad experimentation; they sought autochthonous values; they acquired a new freedom in theme and technique. Gradually old rancors evaporated and the notes of conciliation with Spain and Portugal were heard. Under the stress of the World War, the more radical spirits, especially in Argentina and Mexico, added to the potent influences that of a Russia struggling toward redemption; thus, while affirming an intenser nationalism, they helped pave the way to an international culture.

Spanish-American Literature. Much of the earliest writing in the New World has remained in manuscript, owing to the high cost of paper and to fear of censorship. In 1539, printing was first established in Mexico, and then in Peru. Chief among the early chronicles are those of Las Casas (*Brevísima relación de las destrucción de las Indias*) and of the Inca, Garcilaso de la Vega (*Los comentarios reales*). Under Ariosto's and Ercilla's influence (Alonso de Ercilla y Zúñiga (1533-94) based his famous epic, *La Araucaña,* on his own experiences in Chile), new world authors wrote the conventional epics. Bernardo de Balbuena (1568-1627) in *La grandeza Mexicana,* 1604, like his predecessor, Pedro de Oña (in *Arauco domado,* 1594) employed native themes.

The dramatist Alarcón (1580-1639), despite his Mexican birth, belongs chiefly to Spanish literature. His compatriot, Sor Juana Inés de la Cruz (1651-95), though under the influence of Gongorism, achieved in her poems an ardor that was not merely a pious symbolism. She was a pioneer of feminism and folklore. It was a Mexican again, José Joaquín Lizardi (1774-1827), who with his *El periquillo sarniento* really inaugurated the American novel. His journal, *El pensador mexicano,* was an important factor in arousing revolutionary sentiment.

The poets of the era of liberation were the Ecuadorian José Joaquín Olmedo (1784-1847); the Cuban,

José María Heredia (1803-39); Juan Cruz Varela of Argentina (1794-1839); and Andres Bello (1781-1865). They were followed by José Marmol (1818-81), the author of *Amalia;* Olegario Victor Andrade (1838-95), poet-laureate of Argentina; Jorge Isaacs (1837-95), famous for his tale *María;* and such romantic singers as Pesado and Flores in Mexico, Caro in Colombia. Enthusiasm for native themes produced an entire literature of the *gaucho,* viz., Sarmiento's *Facundo,* Del Campo's *Fausto,* Hernandez's *Martín Fierro* and the "pampa" poetry of Esteban Echeverría (1805-51). In Peru this regionalism took the form of Ricardo Palma's delightful series of *Tradiciones peruanas,* 1872.

The genuine contribution of Spanish-America to the poetry of the world begins in the second half of the 19th century. Such precursors as Gutiérrez Nájera and Díaz Mirón, of Mexico; José Martí and Julian del Casal, of Cuba; Julio Herrera y Reissig, of Uruguay; and José Asunción Silva, of Colombia, either prepared or helped to emphasize the advent of the Nicaraguan Rubén Darío (1867-1916), in whom the *Modernistas* found their brilliant leader. Round Darío flocked a remarkable group of singers, who imparted new impulses and suggested new orientations to the complex poetic renaissance, finally, in the trying days of 1898, affecting Spain itself. Amado Nervo, of Mexico, reintroduced a note of spiritual *rapprochement* with Spain; González Martínez in Mexico reacted against the over-refined delicacy symbolized by Darío's swan and summoned his listeners to the fecund contemplation connoted by the owl; Chocano sang the native soul of his America, and his compatriot, Eguren, struck a neo-symbolic note. The current veered toward what has been variously called *Americanismo, criollismo, mundonovismo.* In the drama, Florencio Sánchez (1875-1910) established native themes. José Enrique Rodó (1872-1917), in *Ariel* and *Los motivos de Proteo,* became the representative South American essayist, and was surrounded by a notable group with varying outlooks. R. Blanco Fombona and Manuel Ugarte came to be propagandists of a Spanish-America freed from sinister North American interests.

Brazilian Literature. Four chief periods may be distinguished: Formation, 1500-1750; Autonomous Development, 1750-1830; Romantic Transformation, 1830-70; and the modern Critical Reaction, which ran through Naturalism, Parnassianism and Symbolism until a new nationalism set in at the turn of the century.

The salient chronicler of the first period was José de Anchieta (1530-97). The chief poets were Bento Teixeira Pinto (who lived in the second half of the 16th century), Manoel Botelho de Oliveira (1636-1711) and Gregorio de Mattos Guerra (1633-96). The close of the period witnessed the formation of academies. To the succeeding period belonged the poets of the Mineira school, two of whom, José Basilio da Gama and José de Santa Rita Durão, produced respectively the national epics *Uruguay,* 1769, and *Caramarú,* 1781. The lyrists of the group are Claudio Manoel da Costa (1729-89); Thomas Antonio Gonzaga (1744-1809?), famous for his Petrarchan poems to *Marilia,* Alvarenga Peixoto (1744-93) and Silva Alvarenga (1749-1814). José Bonifacio de Andrade e Silva (1763-1838) dominated his day not only in letters but in politics and in science.

Romanticism was of various distinct phases in Brazilian poetry. Gonçalves de Magalhães (1811-82) represented the religious aspect, and Gonçalves Dias (1823-64), the naturalistic. Doubt pervaded the work of Alvarez de Azevedo (1831-62), and Castro Alves (d. 1871), stood for social reclamation and the abolition of black slavery. The Brazilian novel was the product of the Romantic movement and made its true beginning with J. Manoel de Macedo (1820-82) and José de Alencar (1829-77). Alencar, in *Guarany* and *Iracema,* was the apostle of Indianism. *Sertanismo* (from *sertão,* hinterland) was initiated by J. da Silva Guimarães (1827-85). *Innocencia,* by Taunay (1843-99) was translated into many languages.

The last half century in Brazil has witnessed a surprising efflorescence of cultural activity. In poetry, Romero, the literary historian, and Martins Junior sponsored a "scientificist" reaction, hastening the advent of Parnassianism. Luis Guimarães and the early Machado de Assis aided; Theophilo Dias, Raymundo Correia, Alberto de Oliveira and Olavo Bilac completed its acclimatization. The naturalistic novel in Latin-America is largely the work of Machado de Assis, Aluizio de Azevedo, Julio Ribeiro and Raoul Pompeia. Regionalism is emphasized by Euclydes da Cunha; the esthetico-social novel by Graça Aranha, in *Chanaan;* neo-naturalism by Coelho Netto in many tales and novels; and self-contained nationalism by the tales, essays and journalism of Monteiro Lobato. The literary criticism of José Verissimo and the historical writings of Nabuco and Oliveira Lima represent a fecundating intellectualism. I. G.

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LATINI, BRUNETTO (1220-c. 1295), Italian statesman and scholar, was born in Florence, about 1220. He was active in the political movements of his time, engaged on a number of diplomatic missions and occupied many important government posts in Tuscany. While in Paris in 1261-68, he wrote an encyclopedic work in French, *Tresor.* Dante alludes to his friendship with Latini, in Canto XV of the *Inferno.* Latini died in Florence, about 1295.

LATIN LANGUAGE, the chief member of the ITALIC branch of the INDO-EUROPEAN linguistic family, represented by many inscriptions from about 600 B.C. and by a voluminous literature from the 3rd century onward. It is divided into Archaic (300-82 B.C.), Classical (82 B.C.-14 A.D.), Silver (14-117), Archaistic

(117-180), and Late (180 onward), the latter changing imperceptibly into VULGAR LATIN and thus giving rise to ROMANCE. Largely through the influence of the vulgate, Late Latin is still the liturgical language of the Roman Catholic Church; while Classical Latin, artificially revived by the Renaissance, long remained and is still frequently used as an INTERNATIONAL LANGUAGE.

Latin is characterized by a fixed accent, possibly due to ETRUSCAN influence, with consequent weakening of vowels in unaccented syllables and loss of Indo-European diphthongs; by a complicated system of consonants as compared with Indo-European; and by simplification of verbal inflection. The verbal system is primarily one of TENSE, as in Celtic and Germanic, rather than of ASPECT, as in Sanskrit, Greek, and Slavic, and falls into the two divisions of infectum and perfectum, each with a present, past and future, e.g., *dico, dicebam, dicam* as contrasted with *dixi, dixeram, dixero* from *dicere,* "say," further complications arising from loss of the Indo-European aorist (largely merged in the perfect) and of the old optative (merged in the subjunctive). In the noun, the Indo-European instrumental has come to coincide in form with the ablative, while the locative is amalgamated partly with the ablative and partly with the genitive. The vocabulary is marked by a large number of words borrowed from Greek and from various Italic dialects, especially Sabine, e.g., *rufus,* "red," as contrasted with the genuinely Latin *ruber.* L. H. G.

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Vulgar Latin. This is the type of LATIN spoken by the masses and the form from which the ROMANCE languages are derived, differing from classical Latin in being both fluctuating and colloquial. The rise of Christianity, at first a religion of the lower classes, brought their influence to the fore and increased the rapidity of the evolution of their language. Between the 4th and the 7th century, the domination of a stress-accent destroyed the complex quantity of the Latin syllable until finally the tonic syllable was always long, and the unaccented always short. This stress on the accented syllable often caused an interior unaccented vowel to drop; and between the 6th and 8th centuries, partly in consequence of these phonetic changes, important morphological developments took place. The six cases of the Latin declension were practically reduced to two, subject and object; the first three declensions alone survived; the passive was replaced in part by *esse* plus the past participle, and in part by the reflexive; the use of prepositions increased, *ad* being used for the dative, *de* for the genitive, and *per* for the ablative; new pronouns were created: *illui* (*lui*), *illei* (*lei*), or their use was extended; and the increased employment of the demonstrative *il*(*le*), *il*(*la*) with the noun brought about the creation of the article. H. F. M.

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LATIN LITERATURE. By Latin literature is understood the literary works written in the Latin language, either by the early Romans and Latins, or by those who later came under their political or intellectual domination. Historically, Latin literature may be divided into the following periods: Prehistoric Period, until the production of the first drama, 240 B.C.; Period of Development, to the birth of Vergil, 70 B.C.; Golden Age, to the death of Augustus, 14 A.D.; Silver Age, to the death of Hadrian, 138; Period of Decadence, to the Fall of Rome, 410; and Post-Classic Period, until the present day.

Prehistoric Period. Of Latin literature before the 3rd century B.C., a few fragments of prose or poetry on jewelry and pottery, and a few scarcely intelligible monuments of religious origin, may be largely disregarded, though with recognition of the influence of the early period on the structure of the later literature.

Period of Development. The wars of the 3rd century brought the Romans into contact with the Greeks of southern Italy and Sicily, and those of the second carried their political power to the Near East. Offended by the alien culture, conservatives like Cato the Censor, in the face of such Philhellenes as the Younger Scipio, fought to maintain the Roman tradition; but inevitably Roman culture ceased to be provincial and became a vital part of a pervasive Greco-Roman civilization. Isolated, Latin literature might have attained independent significance; the strong personalities of the Latin writers prevented it, though derivative, from becoming unoriginal. They put their individual stamp upon every Greek literary form with which they experimented.

Latin drama began with LIVIUS ANDRONICUS, who made the first translations of Greek drama for the victory games of 240 B.C. The chief writers of tragedy were Nævius, Ennius, Pacuvius and Accius, all of whom followed rather the spirit than the words of their Greek models, not without new interpretations and technique. Their plays, suggestive of modern operas, though popular to the end of the Republic, are now lost. On the other hand, 20 comedies of PLAUTUS and all six that TERENCE wrote have been preserved. Consequently, with the substantial disappearance of the Greek New Comedy, the Latin comedies assume over-importance as the chief examples of the ancient comedy of manners. The difference between the boisterous humor, careless construction and linguistic fertility of Plautus and the restrained innuendo, painstaking dramatization and immaculate language of Terence show that one or both diverged from their models, as one knows Cæcilius Statius did diverge. These three poets wrote *palliatae,* comedies of Greek costume, scene and plot. Less successful were the *togatae* of Nævius, Afranius and others, in which the costumes and scenes were Italian. Nævius,

especially, attempted also the Romanization of tragedy with his *praetextae,* but the Romans did not tolerate the representation of their own great men on the stage. Dramatic writing was largely dead by the end of the period. Tragedy went off into pageantry, pantomime, i.e., ballet, or rhetoric; while comedy became pantomime or farce—either the Atellan (presumed ancestor of the *Commedia dell' Arte*) or the realistic mime so popular under the Empire.

Latin epic poetry also began with Livius Andronicus, whose *Odyssey* was long a school book. Mævius made in the old native Saturnian meter an epic of the Punic War. Ennius, for the variety of his experiments known as the Father of Latin Poetry, followed with his *Annales,* a history of Rome, chronological, yet Homeric, written in the first successful Latin hexameters. Ennius, also, wrote satires or miscellanies; but the real inventor of this peculiarly Roman type, the first writer of satires in the modern sense, was LUCILIUS.

Literary prose developed more slowly than poetry. History was at first epic, or Greek, or annalistic after the style of the old archives; but later it took the form of romantic narratives, in turn displaced towards the end of the Republic by monographs and biographies. Under the tutelage of Greek masters and in the stern school of political discussion, Latin oratorical style made great progress from the unimaginative plainness of Cato the Censor, the first Roman statesman to publish his speeches, to the floridity of Hortensius, Cicero's elderly rival. (*See* CATO, MARCUS PORCIUS.) Cato, it may be added, wrote the first original Latin history, as well as an important work on agriculture. For the most part, the writings of the Period of Development have been poorly preserved.

The Golden Age produced the most important monuments of Latin literature. The seeds of the preceding period now bore fruit in two of the greatest stylistic achievements in European literature, Ciceronian prose and Vergilian verse. CICERO was the last great product of the Roman rostra and curia. In his orations, especially, rhythmical prose reached its perfection. But he showed like mastery of the style appropriate to letters and to philosophic, political and rhetorical essays. In his letters he reveals himself and his times, and in his essays he popularized philosophy and rhetoric. Of less brilliance, though important, were the learned treatises of Varro on agriculture and grammar, of Vitruvius *On Architecture,* the plain military annals of Cæsar, the vivacious histories of Sallust, the popular biographies of Nepos. Livy, in a restless style reminiscent of Sallust and anticipatory of Tacitus, tells with substantial accuracy the long story of Roman history as it appeared to a moral reformer who commended to decadent Augustans the rugged virtues of their forefathers. *See also* separate articles on these authors.

The earliest poet of the Golden Age was LUCRETIUS, whose exposition of Epicureanism with its atomic foundation is of less significance than his evangelical denunciation of religious superstition and fear of immortality. Lyric poetry flowered with rare tenderness and imagination in Catullus's passionate songs to Lesbia and in his imitations of learned Alexandrian poems. A new imperialistic note was struck by VERGIL, who combined the *Odyssey* and *Iliad* to glorify the Roman state and the Augustan house in the *Æneid,* finest of Latin epics. His *Eclogues* and *Georgics,* likewise based on Greek models, hold similar preeminence among Latin pastorals and didactic poems, respectively. For his sensitive emotional endowment and command over his medium, Vergil is one of the world's great poets. HORACE, also, though once a Republican, became an exponent of Augustan ideals. His *Odes* are more objective and universal than the lyrics of Catullus, while his *Satires* and *Epistles* reveal his rare personal and artistic standards. On the one hand he perfected the Lucilian tradition, on the other he anticipated, though in verse, the modern essay. His *Art of Poetry* was long regarded as the final word on ancient dramatic theory.

More individualistic were the writers of elegy, Tibullus, Propertius, and Ovid, who, following the lost Cornelius Gallus, wrote lengthy poems in the elegiac meter, a modified epic rhythm. Partly lyric, partly narrative, these poets sang of love, of country life, of mythical heroes. Tibullus's simple, melancholy strain is in contrast with the passion and Alexandrian obscurantism of Propertius; and the talents of OVID as a story-teller have made his *Metamorphoses* the world's leading hand-book of mythology. Ovid's *Fasti* traced the religious associations of the calendar, while the immorality of his works on love contributed to his exile, whence he wrote his *Tristia,* a mournful plea for recall. Most of these poets of the Golden Age were assisted by some rich man; most famous of such patrons was Mæcenas, the protector of Vergil and Horace.

The Silver Age. The social and political changes of the Silver Age caused a distinct decline in Latin writing. Men restricted in what they might write overstressed the manner of writing. The effect of educational training that was literary and rhetorical without reality appears in nearly every field of Silver literature. Following Vergil, though often afar off, Lucan, Valerius Flaccus, Silius Italicus, and Statius wrote lengthy historical or mythological epics and Calpurnius Siculus wrote *Eclogues.* Artificiality likewise mars the best occasional verse of the period, the *Silvae* of Statius. From the Elder Seneca and Quintilian, whose treatise is still important pedagogically, one gains a detailed knowledge of the rhetorical training of the time. Velleius Paterculus's compendium of Roman history, Q. Curtius Rufus's romantic account of Alexander, Valerius Maximus's collection of anecdotes for the public speaker, even Phædrus's version of Æsop are characteristically Silver in subject and style. Scientific monographs and encyclopedias are natural in a learned age: Celsus wrote *On Medicine,* Mela *On Geography,* Frontinus *On Aqueducts,* while Columella maintained the agricultural tradition of Cato and Varro, Manilius versified *Astrology,* and

Suetonius told of *Famous Men* and *The Caesars.* The prize excerptor, however, was PLINY THE ELDER, whose bookish industry produced in 37 volumes the most important surviving ancient encyclopedia. The letters of his nephew, PLINY THE YOUNGER, bring to life a country gentleman and officeholder of the end of the 1st century.

More important, for their Stoic doctrine and pointed style, are the philosophic essays of the Younger Seneca. Equally rhetorical are his tragedies, the sole complete examples of Latin writing in that field; while his vicious assault on the dead Claudius is the best example of the Menippean satire, or mixture of prose and verse, first written in Latin by Varro. Akin to this is Petronius's *Satyrica,* the first known picaresque novel in European literature, and despite its fragmentary condition, of rare value for the study of colloquial Latin. Satire in fact was the most important form of literature that flourished in the Silver Age. Persius in his bookish Stoicism is akin to Seneca; while Juvenal's vigorous cynicism is only matched by the two-edged sword of Martial's *Epigrams.* Tacitus, in prose, displayed qualities similar to those of the great writers of satire and epigram. In his historical writings he is the master of innuendo, whose injustice can be proved from his very own words. His style, breaking away from the Senecan, is the acme of condensation and variety, yet frequently sententious.

The Period of Decadence brought a reaction. The pointed style, too peppery to be endured indefinitely, was rejected. Thinking that the style of the Silver Age was based on the great writings of the Golden Age, Fronto sought a fountain of good style in the old-fashioned language of the early Republican writers. So arose a new archaizing style as unnatural as the artificiality against which it was a revolt. To this school belonged Aulus Gellius, who collected a miscellany of antiquarian interest. Under this influence the scholarly and versatile APULEIUS in his *Golden Ass* adapted into flowery Latin the Greek tale of Lucius transformed into an ass, adding with other stories that of Cupid and Psyche. Of similar African origin were the lyric poet Nemesianus, and a group of Christian apologetes, Minucius Felix, Tertullian, Cyprian, Arnobius, Lactantius and Augustine. About the same time in France a professor named Ausonius was writing of the beauties of his native Moselle. A new romanticism was abroad, well-expressed in the anonymous *Festival Hymn to Venus.* The effect of Christianity is evident on the classic borrowings of poets like Prudentius, Claudian, and Namatian, and of prose writers like Jerome, author of the Latin Vulgate, who chided himself for being a Ciceronian rather than a Christian.

Post-Classic Period. Latin literature, no longer pagan, had become Christian; no longer national, but cosmopolitan, it was becoming increasingly monastic. Out of the monasteries came the Latin writings of the Church Fathers, and in course of time such interesting adaptations as Hrosvitha's Christian dramas based on Terence. Since Latin was the language of scholars, FRANCIS BACON wrote in Latin to combat scholasticism. Today as ever Latin is the official language of the Church of Rome. In a sense, therefore, Latin literature is still being written, though classic Latin died some 1500 years ago. F. W. W.

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LATIN MONETARY UNION. *See* MONETARY UNION.

LATINO SINE FLEXIONE or **INTERLINGUA,** an INTERNATIONAL LANGUAGE invented in 1903 by Giuseppe Peano, professor of mathematics at the University of Turin. It supplanted Idiom Neutral, the creation of a committee formed from the old VOLAPÜK Academy, just as the latter had replaced Volapük itself. It is based on a theory that declension, conjugation, gender and number are unnecessary, and is thus, as its name implies, Latin stripped of all inflection, words common to modern European languages being added to make the vocabulary practical for the requirements of the day. H. S. E.

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LATINUS, in Roman mythology, king of Latium and father of LAVINIA, whom AENEAS married at the end of his wanderings. The parentage of Latinus has been variously ascribed to ODYSSEUS and CIRCE, HERCULES and Fauna, and to Faunos and the nymph Marica. The inhabitants of Latium spoke Latin.

LATITUDE, in geography, is the angular distance between a given place and the earth's equator. It is qualified by adding north or south, and runs from 0° at the equator to 90° at the poles. In astronomy latitude correspondingly signifies the angular distance between an object and the ECLIPTIC; galactic latitude, the angular distance between an object and the great circle of the MILKY WAY.

LATITUDE, VARIATION OF, the name given to the observed effect caused by the shifting of the poles of the earth inside the body of the earth, without changing the direction in space of the axis of rotation. The actual amount of variation is very minute, as the wanderings of the poles are confined to a space less than 60 feet in diameter.

LATONA, in Roman mythology, the mother of APOLLO and DIANA, the same as the Greek Leto. She was the daughter of the Titan Coeus and PHOEBE and was wooed by JOVE. Early legend says that the island of Delos alone of all lands would give Latona shelter for the birth of her children, and this only when she promised it should be the seat of worship of the god she bore. A later story is that POSEIDON anchored this island in the sea as a place of refuge for Latona against the jealous rage of JUNO. Latona was worshiped with her children at both Delos and Argos. In Crete also was a grove sacred to the goddess.

LATROBE, BENJAMIN HENRY (1764-1820), American architect and engineer, was born in Yorkshire, England, May 1, 1764, and educated in Germany. After working as an architect in London, he came to the United States in 1796. He was engineer of the James River and Appomattox Canal, Virginia, and later designed the Bank of Pennsylvania, Academy of Art, and Bank of the United States, Philadelphia. In 1803 he was named surveyor of public buildings in Washington, and after the burning of the city by the British in 1814 he was appointed architect of the Capitol, but resigned in 1817. He died at New Orleans, Sept. 3, 1820.

LATROBE, a borough in Westmoreland Co., southwestern Pennsylvania. It is situated on Loyalhanna Creek, 40 mi. southeast of Pittsburgh and is served by the Pennsylvania Railroad. Coal and natural gas are found here in abundance. Iron, steel and coke are the leading industrial interests. In 1929 the retail trade amounted to $6,474,650. Just southwest, at Beatty, is St. Vincent's College. Latrobe was founded in 1842 and the borough was incorporated in 1854. Pop. 1920, 9,484; 1930, 10,644.

LATTER DAY SAINTS, REORGANIZED CHURCH OF THE, a church established in 1844, after the death of JOSEPH SMITH, the founder of the MORMONS, by some of the congregations unwilling to follow BRIGHAM YOUNG, the leader of the majority, into Utah. The reorganization was effected in part in Wisconsin in 1853, when it claimed to be "the true and lawful continuation of and successor to the original church of Latter Day Saints." In 1860 Joseph Smith, the son of the founder, joined this body, and was its president until his death in 1914. The Reorganized Church repudiates plural marriages and stresses the virtues of family life and the worship of God "in spirit and in truth." It maintains an extensive foreign missionary work, and is strongest in the states of Missouri, Iowa, Michigan, Illinois, California, Oklahoma and Ohio. Its headquarters are at Lamoni, Iowa, and it has a strong center and training schools at Independence, Mo.

LATTICE-LEAF (*Aponogeton fenestralis*), an aquatic perennial allied to the water-plantain, called also lace-leaf. It is a native of Madagascar, widely grown in aquaria for its peculiar foliage. The submerged, skeletonized leaves consist of a lattice-like network of veins.

LA TUQUE, a town of Champlain Co., Quebec, Canada, situated on the Canadian National Railway, and at the head of steamboat navigation on the St. Maurice River, 130 mi. northwest of Quebec, and 85 mi. north of Three Rivers. An important lumbering center, it contains saw, paper and pulp mills, and sash and door factories. Hydroelectric power is derived from the La Tuque Falls. The town lies at the gateway of one of the finest fishing and hunting areas in North America. Pop. 1921, 5,603; 1931, 7,871.

LATVIA, a republic of Europe, bordering on the Baltic Sea and bounded on the north by Esthonia, on the south by Lithuania and on the east by Russia. Before the World War it was part of the Russian Empire, and was known as the province of Courland. On Nov. 18, 1918, it was proclaimed an independent republic at RIGA and was recognized as such by all the important powers. On Sept. 22, 1921, it was admitted to membership in the League of Nations.

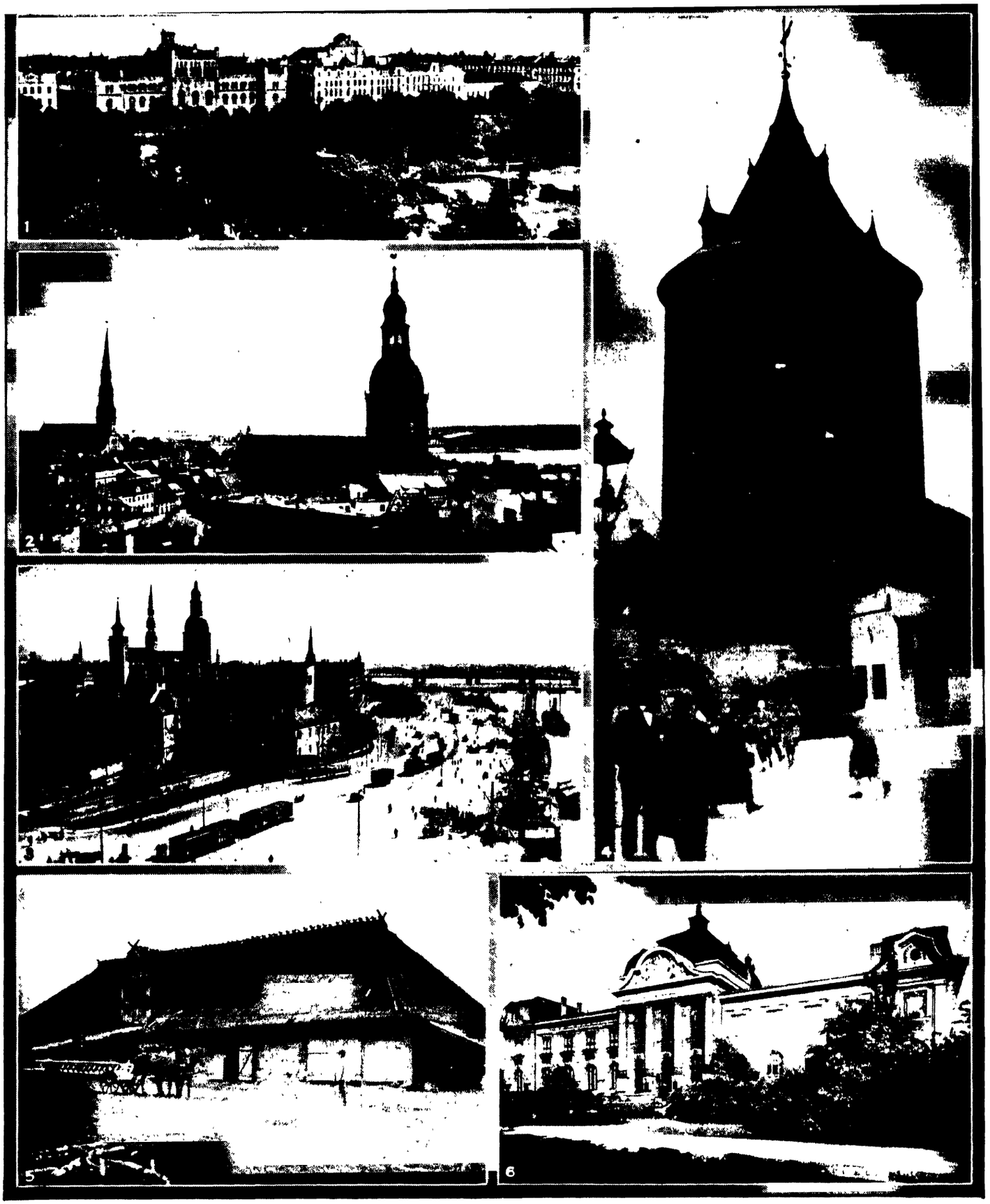
The country has a coast line along the Baltic Sea of 338 mi. and is for the most part wooded lowland, the highest point of land not exceeding 1,000 ft. The total area is about 25,000 sq. mi., one-third of it being covered with forest. Nearly 70% of the population is engaged in agriculture, forestry and related pursuits. The principal agricultural products are rye, barley, oats, potatoes and flax. In 1929, the output in metric tons of these products was: rye, 24,290; barley, 213,580; oats, 347,000; potatoes, 1,125,670; flax, 14,640. In 1925, Latvia produced nearly 100,000,000 cu. ft. of timber. This, together with butter and flax, is the chief export. In 1928, the value of the timber export was 95,469,736 lats, a lat being equal to one gold FRANC. The total value of the exports in 1928 was 26,359,000 lats and of the imports, 308,808,000 lats. Machinery, textiles, foodstuffs, sugar and tobacco are the principal imports. In 1928, the country had about 1,000,000 sheep and as many cattle. There were, in the same year, some 3,000 manufacturing establishments of all kinds employing 53,000 persons. Woodworking is an important industry, although many people are engaged in metallurgical and chemical industries. A strict balance between national revenue and expenditures is maintained by the government. For the last three years, the revenue and expenditures have averaged 160,000,000 lats per annum. The total national debt in 1929 was less than $20,000,000.

According to a census in 1929, the population of Latvia was 1,895,016, of which over 75% was Lettish, that is, Latvian. Russians, Jews, Germans, Poles and Lithuanians formed the remainder. The largest city is Riga, the capital, with a population of 339,324. Other important cities are Liepaja, 60,763; Daugavpils, 40,640; Jelgava, 28,321. Riga is the chief port and is connected by railway with the Russian and European systems. The total mileage of the Latvian railways in 1929 was 1,789. There were in the same year 125 vessels, with a gross tonnage of 132,907, sailing under the Latvian flag. In 1928, 4,335 vessels passed in and out of the ports.

The official language of the people is Lettish, which is akin to the Lithuanian and the old Prussian. About 60% of the people are Protestant. Of the remainder, the Roman Catholics constitute the largest group. There are about 75,000 Greek Orthodox Catholics. Elementary education is compulsory and the public schools are maintained by state funds. Higher education is provided by the Latvian University at Riga, which in 1929 had an enrollment of 8,000 and a teaching staff of 340.

According to the constitution adopted by the Constituent Assembly in 1922, Latvia has a single legislative chamber, called the Saeima, composed of 100 members elected for a term of three years. The

LATVIA



COURTESY LATVIAN CONSULATE GENERAL

LATVIAN SCENES, CITY AND PROVINCIAL

1. Buildings of the University of Latvia, Riga. **2.** The Dom, or St. Mary's Cathedral, at Riga, dating from the 16th century. **3.** View of the Dwina or Daugava river front in the Latvian capital. **4.** The ancient Powder Tower in the old quarter of Riga. **5.** A Latvian barn for grain storage, with thatched roof, commonly seen in northeastern Europe. **6.** National Theater, Riga. The theater is supported by a government subsidy.

Saeima elects the president of the Republic, who in turn appoints the prime minister, the latter choosing his cabinet. The president cannot serve more than six years.

HISTORY

Early History. The modern Latvian Republic occupies the area of the old districts of Courland and Livonia inhabited by the Letts, kindred to the Lithuanians (*see* LITHUANIA, *Early History*) in the 10th century. The two provinces were occupied by the Knights of the Sword (in the early 13th century absorbed by the Teutonic Knights) during the 12th and 13th centuries. The descendants of members of this order long constituted the aristocracy and still make up much of the upper classes. After the middle of the 14th century these provinces were practically independent under their German aristocracy. Protestantism obtained a firm hold in Courland during the 16th century, but not in Livonia. In 1561, both came under Polish suzerainty. Gustavus Adolphus of Sweden annexed Livonia in 1629, but after the defeat of Charles XII by Peter the Great it was annexed to Russia in 1721. Courland remained under Poland until it fell to Russia by the third partition of Poland in 1795.

19th and 20th Centuries. A policy of intense Russification followed a few years after annexation. There was little chance for the expression of nationalist sentiments until Russia relinquished the territory by the Treaty of Brest-Litovsk, Mar. 3, 1918. A provisional government was set up while the country was occupied by German troops; but as these were withdrawn the Red army advanced, driving the Government from Riga in Nov. 1918, and from Mitau and Libau by the end of the year. An organization of local levies, remaining German troops and allied officers took the field and recaptured Riga in May 1919, cleared the country by Jan. 1920 and reestablished the Latvian Government, whose independence and boundaries were established by the Versailles Treaty. A customs and foreign policy union was effected with Estonia and Lithuania in May 1924 and has since been in force.

LAUDANUM. *See* OPIUM.

LAUDER, SIR HARRY (MAC LENNAN) (1870-), Scottish entertainer, was born at Portobello, Aug. 4, 1870. He was a mill-boy in a flax-spinning mill, later becoming a miner. His first stage appearance was at Arbroath. He was knighted in 1919 in recognition of his services during the World War when he devoted himself to cheering the troops at the front. He has written both words and music of his songs, most of them based on Scottish folk-songs. His *I Love a Lassie* became a classic in all English-speaking countries. Several autobiographical works are from his pen, including *Roamin' in the Gloamin'*, which appeared in 1928.

LAUDS (Latin *laudes*, songs of praise), one of the daily prayers of the breviary of the Catholic Church, following immediately after MATINS and corresponding to VESPERS. A prominent part is taken by the *Benedictus*, the song of Zacharias, Luke 1:68-79. Another part of the breviary for lauds is the *laudes matutinae*, prescribed for sunrise, in earlier times called *Gallicinium*, the crow of the cock.

LAUFER, BERTHOLD (1874-), German-American anthropologist and Orientalist, was born at Cologne, Germany, Oct. 11, 1874. He was educated at the universities of Berlin and Leipzig, and in 1898 came to the United States. In 1898-99 he conducted the Jesup North Pacific Expedition to Saghalin Island and the Amur region of eastern Siberia to conduct ethnological researches among the native tribes. Subsequently he led various expeditions to China and Tibet. He was appointed assistant curator of the East-Asiatic Division of the Field Museum of Natural History, Chicago, Ill., in 1908, association curator of Asiatic Ethnology in 1911 and curator of anthropology in 1915. In 1928 he was made associate editor of the *American Journal of Archaeology*. Dr. Laufer has been a member of numerous scientific organizations throughout the world. His extensive field-work in eastern Asia has resulted in many scholarly monographs on the archaeology, art and ethnology of that region. Among his best-known works are *Jade, a Study in Chinese Archaeology and Religion, Ivory in China, The Prehistory of Aviation* and *Geophagy*.

LAUGHTER, a facial and vocal expression of amusement, derision, or scorn. It may be provoked by a number of different objects or subjects and is an expression for both merriment and contempt, pleasure and scorn. The simplest form is that which results from tickling. A pathological form is that of giggling. The most general forms are, however, those of joyous laughter as in play, teasing, practical jokes, contests, and relief from restraint. Among the situations which ordinarily cause laughter are novelty, as the circus to the child; depravity, as the hunchback when he does not arouse pity; moral depravity, as in cowardice and miserliness; breach of order or rule, the source of the clown's repertoire; small misfortunes, as in loss of dignity, coarseness, when it does not offend cultural taste; pretense as in new-rich society; want of knowledge or skill, as in a foreigner; absurd relations, as a Yale student playing marbles; wit, mainly a play of words; expression of the merry mood, as in play; the strained laughter of the victor in contest.

Laughter is a social phenomenon, indeed, a social language, capable of creating a vast range of refinement in expression. As such it is contagious. We laugh with those who laugh. It is chastising; its sharp edge can be far stronger than words. It may be a form of bravado or effort to cajole out of hostility. It is an index to social approval, a means of ranking for conformity to the group. It is a force in social movements, fads and fashions determining the limits beyond which one cannot go. As a means of social refinement it develops the sense of humor, which has biological value, favors generosity, and a

tendency to share. It is a means of cultivating cosmopolitan tastes. As an expression of the play attitude, it has value as preparation for life, enjoyment of life, and exhilaration of life, and is one of the rewards for life.

Genetically, audible laughter is an outgrowth of the smile which is its most primitive form. In a word we may characterize the development of the smile saying that it is a reflex which was perhaps first noticed as the puckering of the mouth of the infant, expressing satisfaction, after feeding on the mother's breast. Biologically it means, "I am satisfied, I have had enough, I am well disposed." This primitive signal took on more and more significance with the racial development, coming to mean a sign of approval or satisfaction, first, of material comforts, then of simpler sensory pleasures, and gradually to every phase of cultured society. The number of things to which we give our approval by a smile increases with the increase of knowledge and cultural interests. At the same time culture stages are indicated by the number of things at which we have ceased to smile.

The opposite of the smile is a frown and it has a parallel history, so that the psychology of the frown is the same as the psychology of the smile, except that one is negative and the other positive. Likewise, crying is the opposite of laughter, and the genetic aspects of crying are very much the same in principle as those of laughter. The smile and the frown represent a universal language. It can be understood in all races and climes, and is capable of conveying great refinement, thought and feeling. The genuine smile is unconscious; the voluntary smile is an affectation. The unconscious smile always tells the truth; whereas the voluntary smile is often an effort to cover up truth.

The mind reader can perform wonderful stunts by knowing how to read the responses of the organism through inceptive stages of smile and frown which automatically give him the answer that he seeks, in the form of yes or no to his leads. While it conveys ideas in itself, the smile is primarily the affective language, expression of feeling which accompanies language, and as such has the power to move, to arouse our feelings to the extent that it is genuine. It lends grace and cheer, as at the table, affecting not only the guests, but even the digestion of the hostess herself who smiles. In itself it is a sort of barometer indicating approval or disapproval of the group, and with a spoken language, an indispensable accompaniment to good will and good feeling, being the keenest cutting tool as a means of social chastisement and the most soothing balm for the heart that craves sympathy and approval. Paraphrasing, we may say, "Tell me at whom you smile or laugh and I will tell you who you are." C. E. S.

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LAUNCELOT, SIR, in the ARTHURIAN LEGENDS, one of the bravest knights of King Arthur's Round Table. His adulterous love of Queen Guinevere was a chief cause of the disruption of the Round Table. In Tennyson's *Idylls of the King,* the "Fair Maid of Astolat" (Elaine) dies of love for him.

LAUNCH. *See* BOAT.

LAUNDRIES, COMMERCIAL. According to the U.S. Bureau of Census, the amount received by commercial power laundries for services in the United States in 1929 was $541,158,197—an increase of 50% compared with 1925. The number of power laundry wage earners increased from 169,200 in 1925 to 233,187 in 1929. Their wages increased during the same period from $162,466,259 to $228,860,727.

The ten leading states in the industry reported receipts totalling $340,417,685 in 1929 as follows:

New York	$80,343,219	Ohio	$25,307,269
Illinois	53,816,242	Massachusetts	24,028,958
California	45,856,344	Texas	19,949,326
Pennsylvania	28,081,642	Michigan	19,637,638
New Jersey	27,557,762	Missouri	15,839,285

It is estimated that the power laundry industry has $229,434,300 invested in machinery and equipment, and $147,857,660 in land and buildings.

The industry supports the American Institute of Laundering, which has been termed "the proving and improving station of the laundry industry." This institute serves in an advisory capacity to members of the Laundry-owners National Association of the United States and Canada, and conducts research laboratories, a vocational training school and a completely equipped commercial laundry employing the latest available equipment and methods.

POWER LAUNDRIES, U.S., 1909-1929

Year	*No. of Laundries*	*Wage Earners*	*Wages $*	*Am't Rec'd for Work Done $*
1909	5,186	109,484	44,826,978	104,680,086
1914	6,097	130,641	59,471,244	142,503,253
1919	5,678	131,879	92,898,837	236,382,369
1925	4,859	169,200	162,466,259	362,294,749
1929	6,776	233,187	228,860,727	541,158,197

In addition, the laundry industry through its National Association supports a research fellowship at Mellon Institute of Industrial Research at Pittsburgh, Pa. G. H. J.

LAUNDRY EQUIPMENT, for domestic use, comprises washers, driers, wringers, and ironers. Washing machines may vary from a small machine with a capacity of three or four towels to a large domestic washer handling ten full-sized sheets. Both the small and large electric washers may be had with centrifugal water extractors or with a power operated wringer; on the small model, the wringer usually operates by hand, and on the larger ones, is driven by the same motor which drives the washer mechanism.

The electric washing machine is one of the earliest and most widely used of electrical HOUSEHOLD APPLIANCES. In its first form it was simply the hand operated model, then in use, driven by an electric

motor. The first washers designed primarily for electric operation were marketed about 1907, and operated on the principle of a rotating and reversing cylinder. The clothes within the cylinder were carried through the water in the tub, and the mechanical action, reversing the direction in which the cylinder turned, prevented "tangling" the laundry. In the development of this machine there has been much research on the most efficient mechanical washing action. Other means than the rotating cylinder were developed, including the "elliptical" type, in which the laundry was moved from one end of the machine to the other over a curved corrugated surface similar to a washboard. Then came new innovations: the "dolly" type, in which three wooden pegs mounted on a revolving base agitated the clothes; the "vacuum-cup" principle by which metal cups, turning as they were raised and lowered, forced soap suds through the clothes; and the "agitator" method, now most commonly in use, in which metal arms turn and reverse at the bottom of the tub, producing the required action.

Of these washing methods, there have been a number of modifications by individual manufacturers. Of the types preceding the agitator, the vacuum-cup alone retains its popularity. Tubs for domestic washers have passed through many stages of development in material and design. Wood, galvanized iron, copper, aluminum and enamelled iron have been most commonly employed.

The swinging, or adjustable wringer, was an early improvement. Much work has also been done on wringer design and material, developing from small rolls of relatively hard rubber to the larger and softer "balloon" rolls. Practically all wringers have a quick release for the roll pressure, and are adjustable for use with various weights of material. The centrifugal method of extracting the water from clothes, commonly used by power laundries, was early adapted to the domestic laundry. The earlier forms of application made the extractor a part of the washing mechanism, but they required adjustment to bring the basket from a low position within the tub into a position above the water level. More recent has been the development of a domestic washer in which the centrifugal dryer is contained in a separate compartment from the washer proper, and smaller in diameter, than the washing compartment. Both actions are driven by one motor, and may be carried on simultaneously.

The development of the domestic ironing machine or "mangle," followed the development of the washing machine, but has progressed more slowly both in the development of mechanical design and in domestic acceptance and use. Early domestic ironing machines were heated by gas, and were somewhat large and cumbersome. Refinements of design have applied electric heating to the ironing shoe, and have diminished the size and the weight. Present ironing machines are equipped with an ironing shoe not more than 42 inches in length and with a padded roll operating against it. Pressure is applied either manually or from the electric motor which turns the roll. A model in fairly wide use omits the electric motor, being attached to the wringer post of an electric washing machine, and takes its power from the same motor mechanism that is provided to turn the wringer. A very recent development in domestic electric ironers operates on the principle of clothes pressing machines. The turning roll and the motor are omitted, only manual pressure is used to bring the heated shoe on to the padded surface.

In general, ironers to-day are heated by electricity, using about 1280 watts, the amount of electric current being determined by the amount of current which the National Electric Code allows to be drawn from a wall outlet connection. On account of the excellence of design the permissible amount of current is sufficient to provide the requisite heat. Coming rather later than the washing machine, the ironer has not generally had as great a popularity or as wide a use, somewhat less than 10% of the families that own washers also owning ironing machines.

A third device for the home laundry is the CLOTHES DRYER. L. E. M.

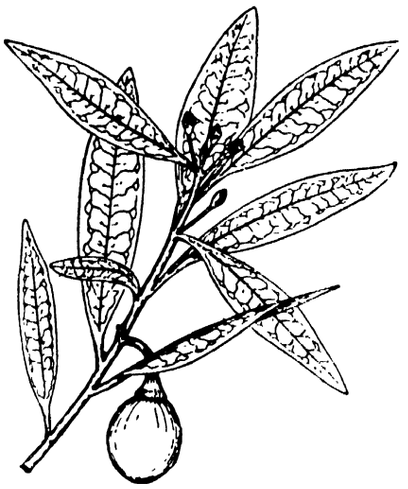
LAUREL, a genus (*Laurus*) of trees of the laurel family, known also as sweet bay, comprising two Old World species. The noble laurel (*L. nobilis*), native to Mediterranean countries, is the laurel of history. Although naturally a tree, sometimes 40 or 60 ft. high, it is widely cultivated in various forms as a tub plant. It bears stiff, evergreen leaves, small yellowish flowers and dark purple berries. The laurel, known to the ancient Greeks as daphne, was held sacred to Apollo. The leaves and ripe berries were made into wreaths to crown poets, war heroes, and victors in games.

The name laurel is also applied to various evergreen species of *Prunus,* especially to the common cherry laurel (*P. Laurocerasus*), the Portugal laurel (*P. lusitanica*) and the American cherry laurel (*P. caroliniana*), all more or less planted for ornament. The name is given also to species of Kalmia, as the mountain laurel (*K. latifolia*), and to the California laurel (*Umbellularia californica*).

LAUREL, CALIFORNIA (*Umbellularia californica*), a handsome evergreen tree of the laurel family called also Oregon myrtle. It grows in forests from Oregon to southern California, ordinarily attaining a height of 20 to 75 ft., but sometimes rising to 175 ft. The usually branched trunk bears narrow, pungent, aromatic leaves, small yellowish flowers and purplish olive-like fruit. The tree, which furnishes the finest cabinet wood produced in the Pacific states, is occasionally planted for ornament.

LAUREL, a city of southeastern Mississippi, the county seat of Jones Co., situated about 55 mi. southwest of Meridian. Three railroads and bus lines afford transportation. Laurel is a center of the hardwood lumber industry. In 1929 the retail business amounted to $8,446,976. Farming and dairying are carried on in this region. Pop. 1920, 13,037; 1930, 18,017.

LAURENS, HENRY (1724-92), American revolutionary leader, was born at Charleston, S.C., Feb. 24, 1724, a member of a prosperous mercantile family. He continued in trade for many years, chiefly engaged



FROM JEPSON, MAN. FL. PLANTS CALIF., COPYRIGHT

CALIFORNIA LAUREL
Fruiting branchlet

in shipping between London and Charleston, and in 1771 retired from business and traveled in Europe. With the rise of revolutionary sentiment Laurens soon became one of the leaders of this movement, acting as President of the Provincial Congress of South Carolina and member of the Council of Public Safety, but always as an advocate of continued union with the British Crown. With the Declaration of Independence, however, he sadly bowed to the inevitable and threw his whole heart into the cause. He held the position of representative under the South Carolina Constitution of 1778 and was President of the Continental Congress from Nov. 1777 to Dec. 1778. In 1780 he was sent to Holland to negotiate a loan. At sea he was captured by the British and imprisoned 15 months in the Tower until exchanged for Lord Cornwallis.

His son, Colonel John Laurens, was born at Charleston, S.C., Oct. 28, 1754 and educated in England. He joined the Revolution, was a fellow representative with his father under the State Constitution of 1778, and then entering the army, fought at Monmouth, was wounded at Germantown, and while acting as aide to Washington fought a duel with General Lee for some remarks of the latter which Laurens interpreted as a slight to Washington. Sent south in 1779, Laurens went through the siege of Charleston, was sent to France to raise a loan in 1781, returned, and almost at the close of the war was killed in a skirmish along the Combahee River, Aug. 27, 1782.

In the meantime the elder Laurens had been delegated to act in the peace preliminaries at Paris in 1782. After his return ill health forced him to abstain from politics and to take no part in the growing movement for a more centralized government which culminated in the Constitution. He died near Charleston, Dec. 8, 1792.

LAURENS, a city of western South Carolina, and the county seat of Laurens Co. It is situated about 38 mi. southwest of Spartanburg in the midst of a hilly region. Two railroad and bus lines afford transportation. Although the surrounding region is primarily agricultural, Laurens is a manufacturing center. Its leading products are cotton goods, cottonseed oil and glass. The city was founded about 1845 and incorporated in 1880. Pop. 1920, 4,629; 1930, 5,143.

LAURENT, ROBERT (1890-), American sculptor, was born in Concarneau, France, June 29, 1890, and came to America in 1902. He studied at the British Academy of Fine Arts, in Rome, and under Hamilton Easter Field and MAURICE STERNE. He is known for his work in wood and alabaster, particularly carvings of animals and flower forms, and for his large bronzes. Laurent has taught sculpture at the Master School of United Arts and at the Art Students League.

LAURENTIDES PARK, a national park established by the government of the province of Quebec. A large area of approximately 4,000 sq. mi. has been set aside for this park in the mountainous country northeast of the city of Quebec. The park is primarily a fishing territory and national recreation ground and has extensive virgin forest lands, picturesque mountains and numerous lakes and rivers well-stocked with red trout. Camps may be leased by sportsmen.

LAURIER, WILFRID (1841-1919), Canadian statesman, was born at St. Lin, Quebec, on Nov. 20, 1841, of French parents. He was educated at L'Assomption College and McGill University, entered legal practice, and edited *Le Defricheur,* a periodical (extremely French in sentiment and opposed to confederation). Elected to the Dominion House of Commons in 1874, he enunciated a liberalism which, he said, had nothing to do with religion; he denounced all attempts of Church authorities to limit freedom in political affairs. Striking in appearance, a magnetic leader, an orator and a skilled parliamentarian, he became closely attached to Edward Blake, the new Liberal leader after the defeat of Mackenzie's government. When Blake resigned in 1887, Laurier assumed the leadership. He manifested primary devotion to securing harmony between the English and French elements of the Canadian population, and advocated unrestricted reciprocity with the United States. In 1896 a general election ended the long tenure of the Conservatives, and Laurier became premier, the first French-Canadian to hold the office. He led a progressive Canada during 1896-1910, in that time settling the Manitoba schools question in a manner opposed by the Catholic hierarchy, reducing the tariff without sacrificing protection, and beginning the policy of supporting railroads by cash subsidies and guarantees of bonds. He sponsored many measures for westward expansion and improvement of communications, the participation of Canadian troops in the Boer War, and in 1910 a reciprocity agreement with the United States. He favored preferential trade

and tariff arrangements with Great Britain. Laurier's premiership was ended by the elections of 1911, when his reciprocity agreement and naval policy were repudiated. During the World War he was vehemently against conscription and equally against the establishment of hereditary titles and honors in Canada. In 1919 he urged the admission of Germany to the League of Nations. He died at Ottawa on Feb. 17, 1919.

LAURIUM formerly **CALUMET,** a village in Houghton Co., Mich., in the extreme northwestern part of the state. The Copper Range railroad serves Laurium, which is in one of the largest copper districts in the United States. The region has produced almost a quarter of the entire copper-ore output of the country. Pop. 1930, 4,916.

LAURUSTINUS (*Viburnum Tinus*), a profusely flowering evergreen shrub of the honeysuckle family, native to Mediterranean countries and widely cultivated in various forms. It grows sometimes 10 ft. high, bearing glossy, dark-green leaves, and small, slightly fragrant white or pinkish flowers in showy clusters. In the greenhouse the plant is forced to bloom in winter and early spring; when planted out, as in California and the Southern States, it flowers all summer.

LAURVIK. *See* LARVIK.

LAUSANNE, a city of Switzerland, capital of the canton of Vaud, picturesquely situated on the foothills of Mont Jurat and dominated by the cathedral and the castle. The old parts of the city, the Cité and the Bourg, are united by a bridge across the Flon valley, and the narrow old streets still have quaint and picturesque features. The former episcopal palace is seat of the cantonal government. The severe Gothic cathedral was built in the 13th century and dedicated by Pope Gregory X. The 14th century Church of St. Francis, the city hall, 1454, and several fine modern buildings are also of interest. There are excellent schools, a university, and a large number of boarding-schools for boys and girls. The Roman Lausonium, it became the seat of a bishopric about 585 and remained so until captured by Bern, at the time of the Reformation. Pop. 1930, 75,888.

LAUSANNE CONFERENCE, and Treaties of Lausanne. A meeting of the representatives of the principal Allied and Balkan Powers in 1922-23, in which a definitive peace was made with the Turks, radically modified the provisions of the previous treaty of Sèvres. When Turkey signed the Murdos Armistice in Oct. 1918, she was a defeated and demoralized country. Exhausted by war, powerless, apparently, to offer further resistance, she saw large sections of her territory occupied by the armies of her enemies. The peace that was dealt out to her by the Treaty of Sèvres, Aug. 10, 1920, seemed equally as disastrous and inescapable as those imposed upon her former allies. Under its drastic provisions she was to be deprived not only of her non-Turkish provinces, Arabia, Syria, Palestine, Mesopotamia, and Armenia, but also districts bordering the Aegean in Asia Minor, inhabited partially by Greeks, and was to be cut down in Europe to the Chatalja lines, surrendering East Thrace to Greece. Kurdistan was to be granted autonomy. The Turkish army was to be limited to 50,000 men, all aircraft were to be surrendered and most of the navy. Moreover, capitulations were to be restored, Turkish finances and the principal ports placed under foreign control, and the Straits were to be demilitarized and placed under an international commission.

In the hour of defeat there began to develop a nationalist movement under the strong leadership of Mustapha Kemal Pasha, which was to deliver and regenerate the country. Repudiating the Treaty of Sèvres, the nationalists dedicated themselves to recovering what they considered to be the reasonable boundaries of the new Turkish state. The various foreign armies of occupation were attacked and forced back. Especially notable were the successes against the Greeks who were completely driven out of Asia Minor. It was now evident to Allied leaders that the Treaty of Sèvres could not be enforced without resorting to arms. Would the war-weary, debt-burdened peoples sanction such a venture? Already foreign forces in the Near East had largely been demobilized.

Very reluctantly, after two lengthy conferences held between Nov. 1922 and July 1923, the nine allied powers, United States, Great Britain, France, Italy, Japan, Russia, Greece, Rumania and Yugoslavia, came to terms with the Turkish nationalists. Of the 17 diplomatic instruments signed during the Conference, the most significant is the Treaty of Peace itself, July 24, 1923. By it the Turks secured virtually everything they asked. True, the non-Turkish provinces were irrevocably lost, but the Turks had become reconciled to this.

Constantinople, the Straits and the hinterland to the Maritza river as well as Smyrna with its tributary territory were restored to Turkey. In the Aegean, she retained the Rabbit Islands off the entrance to the Dardanelles and the islands of Imbros and Tenedos. The Dodecannese, Rhodes and Castellorioza went to Italy, the remaining Turkish islands to Greece. In Asia, Mesopotamia, Arabia, Syria and Palestine were not restored but remained as mandatory territories under France and England. Turkey was freed from all foreign control over her military and naval affairs, from all claims of the allied powers for reparations arising out of the World War, and released from the capitulations which guaranteed to subjects of certain European powers special legal status, postal and other privileges.

The principle of the protection of minorities was recognized as a matter of international concern and "placed under the guarantee of the League of Nations." The demilitarization of the Straits area was provided for, as was the "principle of freedom of navigation" of the Dardanelles, Sea of Marmara, the Bosporus, and the establishment of an international "Straits Commission" under the League.

The Treaties of Lausanne tore up the Treaties of Sèvres, granted Turkey complete independence, and brought her boundaries fairly closely into accord with her linguistic frontiers. E. F. C.

LAVA, the general name for outpourings of molten rock, whether explosively from VOLCANOES or quiet outwellings from fissures or non-explosive volcanic eruptions. It is derived from some deeper-lying reservoir of molten rock, or MAGMA, such as batholithic or laccolithic intrusions. Being suddenly ejected into a comparatively cold atmosphere, the hot, pasty mass cools so rapidly that individual crystals of the component minerals seldom have time to form. Consequently, lavas are usually non-crystalline or glassy; or cryptocrystalline, showing only microscopic crystal structure. They correspond in mineralogic and chemical composition, however, to the more slowly cooled, clearly crystallized IGNEOUS ROCKS, but receive different names because of their different structure. Due to changing conditions within the reservoir mass, the same vent may pour forth dissimilar lavas at different times.

The molten rock coming from the earth's interior usually contains gases and steam under pressure. Relief of this pressure as the magma nears the surface may produce an explosive expansion of the gases which completely disrupts the molten lava, blowing it into the air in fine, quickly cooled particles of VOLCANIC ASH. Falling to earth, these may accumulate in beds of TUFF. A less violent expansion will result in solidification of the lava into masses of cellular rock, such as PUMICE and SCORIA. Molten blobs of lava, thrown spinning into the air during a violent volcanic eruption, sometimes solidify into nearly round "Volcanic Bombs," and jets or drops of lava are caught by the wind and spun out into long, glassy threads, known as "Pele's Hair," after the goddess of Kilauea, the Hawaiian volcano.

Light-colored lavas are called FELSITE, dark ones BASALT, and when the lava is glassy it is known as OBSIDIAN or volcanic glass. Other names are also applied because of peculiar features, as block lava, ropy lava, pillow lava, and it is often possible to make further distinctions on the basis of mineralogic character. Lavas are of widespread occurrence, and are poured forth to-day by Kilauea, Etna, Vesuvius and many other volcanoes. *See also* ANDESITE; PHONOLITE; RHYOLITE; TRACHYTE; BATHOLITH; LACCOLITH; PERLITE; PITCHSTONE. S. F. K.

LAVA BEDS, a national monument in the extreme northern part of California. The tract containing the lava beds is 45,967 acres in extent and was set aside in 1925 under the jurisdiction of the Department of Agriculture. The lava beds contain numerous large caves and tunnels which form unique examples of volcanic action and lava flows. In many of these caves there are rivers of perpetual ice. Possible occupancy by early historic and prehistoric races is indicated by carved and painted Indian petroglyphs on the cave walls. The region was the scene of the Modoc Indian war of 1823. The lava beds are reached by an unimproved road which leaves the U.S. Interstate No. 99 at Weed, and also from Mount Hebron on the Southern Pacific system.

LAVABO (Latin, I shall wash), a wash basin in a church, monastery, a religious house for nuns or cloister, and also a room provided with washing facilities. Lavabo is also the name given to that part of the Mass where the priest washes his fingers before proceeding to the Consecration.

LAVA HOT SPRINGS PARK, a state park in Bannock Co., southeastern Idaho. The park, containing 187 acres, was created in 1913. The health restoring properties of its hot springs have been famous since the days of the Oregon Trail and were known to the Indians.

LAVAL, FRANÇOIS-XAVIER DE (PAVILLON DE MONTIGNY) (1622-1708), first Bishop of Quebec. An ultramontanist and friend of the Jesuits, in 1658 he was consecrated by the Pope's nuncio at Paris, and arrived at Quebec the next year. Of high intellectual qualities but dictatorial, he was the ablest and most aggressive champion of the Church of Canada against secular authority. Laval founded the seminary which eventually became Laval University. In controversies with the home government over his right to remove curés from parishes to which they had been appointed, at his request (1688) he was relieved of office. In 1692 he returned to New France, where he died in May 1708.

LAVAL, PIERRE (1883-), French statesman. The son of a cafe-keeper at Châteldon, Puy-de-Dôme, Laval worked his way through schools at Saint-Étienne and Lyons and the Paris Law School. After building up a flourishing law practice, Laval embarked upon a political career and in 1914, on the eve of the war, was elected Socialist Deputy from Aubervilliers. His career was soon interrupted, however, for service as a poilu. In 1917 he refused to accept a post in Clemenceau's National Government. Nevertheless his political interest and activity continued, and in 1924 he was returned to the Chamber of Deputies on a Republican Union (a Left Centre) ticket.

The following year, 1925, Laval began his ministerial career. As Minister of Public Works in Painleve's Cabinet, he gained his first real prominence by preventing a threatening miners' strike. In the Briand Cabinet of 1926, M. Laval filled the posts of Secretary-General to the President of the Council, and Minister of Justice. During that year he increased his prestige by inaugurating a policy of conciliation which did much to eliminate a French post-war problem, the status of Alsace. In 1927 Laval became Senator from the Department of the Seine. The second Tardieu Cabinet, formed soon thereafter, included him as Minister of Labor.

Laval became Premier of France in Jan. 1931 and maintained his hold until the middle of Feb. 1932 when his Cabinet fell on account of dissension over a new electoral law. During his premiership, Laval had conducted personal negotiations on international

debts with high officials of Germany and the United States. His conversations with President Hoover had at least a profound psychological effect upon the two nations. As premier, Laval had pursued a nationalistic policy, with a firm attitude toward Germany, debts, reparations, and disarmament. At the London Naval Conference of January, 1930, he had balked Italian efforts to gain naval parity with France. The fall of the Laval Cabinet in 1932 marked the first decisive step in the swing of French opinion from the Right to the Left. Laval, however, was retained by the incoming Tardieu Ministry and given his old post of Minister of Labor.

LAVAL, a city of northwestern France, capital of the department of the Mayenne. The older quarter possesses a medieval castle, an ancient twin-towered gate, and a cathedral. Laval was historically the seat of a famous barony: Gilles de Retz, the traditional Bluebeard, was a 15th century Sieur de Laval. Cotton textiles form the chief industry. Pop. 1931, 27,792.

LAVAL UNIVERSITY, at Quebec, P.Q., Canada, a Catholic institution for men and women, and the oldest university in Canada, being an outgrowth of a seminary founded there in 1663. It receives state aid but is not under state control. A general supervision is exercised by the Archbishop of Quebec as Visitor and Chancellor Apostolic. A number of seminaries and colleges are affiliated with the university. The library contains 173,016 volumes. In 1930 there was a student enrollment of 6,997, and a faculty of 495 under the direction of Mgr. P. J. FILLION.

LAVENDER (*Lavandula Spica*), a slightly woody plant of the mint family, native to Mediterranean countries and extensively cultivated in flower gardens. It grows 1 to 3 ft. high bearing narrow entire leaves and small pale lilac-colored flowers clustered in a long interrupted spike. The oil of lavender, distilled from the flowers, is employed in perfumery and in medicine. Both the dried flowers and the leaves are used to scent clothing and linens.

LAVERAN, CHARLES LOUIS ALPHONSE (1845-1922), French physician, was born in Paris on June 18, 1845. He was educated at the Strasbourg faculty of medicine, taking his degree in 1867. He was professor in medicine at Val de Grâce, 1873-1878, and of military hygiene and chemical medicine, 1883-1894. From 1878 to 1883 he served as military surgeon in Algeria, investigating tropical diseases. During this time he discovered the parasites of malarial fever (1880) and described them in all their aspects in 1881. He published four separate treatises on malaria and tropical diseases, as well as treatises on military medicine and military hygiene. Laveran received the Nobel Prize for medicine in 1907 for his work on malaria. He died in Paris on May 18, 1922.

LAVINIA, in Roman mythology, daughter of LATINUS and wife of AENEAS, after he reached Latium. He named the town of Lavinium for her.

LAVISSE, ERNEST (1842-1922), French historian, was born at Nouvion-en-Thiérache, Dec. 17, 1842. He was attached to the cabinet of the Duruy Ministry, and was tutor to the Prince Imperial, also holding many professorial appointments. His remarkable studies of Frederick the Great, *La Jeunesse du grand Frederic* (1891), and *Le grand Frederic avant l'avenement* (1893), gained him fame, both in France and Germany. His real fame however rests on his writings on French history dealing with the period from the 17th century onward. A master of good historical writing his works possess both historical objectivity and clarity of style. He was editor of *Histoire de France* and *Histoire de France contemporaine,* a great cooperative work in 18 volumes, and, with Rambaud, the *Histoire générale depuis le quatrièm siècle.* He died at Paris, Aug. 18, 1922.

LAVOISIER, ANTOINE LAURENT (1743-94), French chemist, was born at Paris, Aug. 16, 1743. In 1768 he was elected to the Academy des Sciences, and in 1771 was appointed tax collector, a position which left him ample time and revenue for his researches. In 1788 he became administrator of the Discount Bank, and in 1791 Commissioner of the Treasury and member of the Commission of Weights and Measures which established the metric system. Lavoisier set himself against the old phlogiston theory of chemistry and was one of the founders of modern chemistry in his attention to accurate quantitative analysis and his conception of unaltering mass. During the Reign of Terror he was accused of oppression in his earlier tax collections and was executed at Paris, May 8, 1794.

LAW, ANDREW BONAR (1858-1923), British statesman and prime minister, was born at New Brunswick, Canada, Sept. 16, 1858. He was educated in the Canadian public schools and at Glasgow, Scotland, High School. After a career as manufacturer in Glasgow in 1900 he entered parliament as a Conservative. He was opposition leader in the Commons in 1911-15, and when the wartime coalition ministry was formed, in 1915, Law became colonial secretary. The next year he was made chancellor of the exchequer. His fame rests primarily on the success which attended his work as wartime chief of Britain's finances. Following the armistice he was a member of the British delegation to the Versailles Conference. When the Lloyd George government fell in 1922, he formed a new ministry, but ill health forced him to resign the next year. He died at London, Oct. 30, 1923.

LAW, JOHN (1671-1729), Scottish financier and originator of the "Mississippi Scheme," was born near Edinburgh, Apr. 21, 1671. He studied political economy, and becoming interested in the banking method of his day, conceived his famous system. Offered to the parliament of Scotland, it was promptly rejected, and Law subsequently procured its adoption by the Duke of Orleans who was regent during the minority of Louis XV. A trading company was formed, to which were converted the French possessions on the banks of the Mississippi, together with the properties of the Senegal, the India and the China

companies. France, for three years, was turned into an exchange and the wildest kind of speculation prevailed ending in the complete crash of 1720. Law narrowly escaped with his life to Venice where he died Mar. 21, 1729.

LAW. For national systems see AMERICAN LAW; ANGLO-SAXON LAW; ENGLISH LAW; FRENCH LAW; GERMAN LAW; GREEK LAW; INDIES, LAW OF; ROMAN LAW; SCOTS LAW. For divisions of law see ADMINISTRATIVE LAW; COMMON LAW; CORPORATION LAW; CRIMINAL LAW; INTERNATIONAL LAW; JURISPRUDENCE; CONFLICT OF LAWS. For laws relating to specific subjects see BUILDING LAWS; CHILDREN, LAWS RELATING TO; CONTRACT, LAW OF; HOMESTEAD LAWS; LABOR LAW; PROPERTY LAW; PUBLIC UTILITIES, LAWS CONCERNING.

LAW, ADMINISTRATION OF, the official adjustment of disputes not otherwise settled. Disputes which achieve some working settlement by argument, persuasion, or compromise do not trouble the law. But in disputes not otherwise adjusted, the institution of official judges—COURTS—affords a way to ease the tension and get on with affairs. The court largely displaces physical combat as the last resort in settling differences.

But in a complex society there is too much court business to be done unless there is some order in the work of courts. This means a somewhat complicated ritual or procedure, aimed at speeding and clarifying work by bringing matters up in a standardized fashion. It also means, however, that the technique of handling cases in court becomes too complex for the ordinary man, so that a specialized profession of lawyers must serve as spokesmen for the parties in dispute. And this must mean, in turn, that the relative skill of the lawyers often intervenes to lose a good cause or win a bad one. The aim of law administration is to get disputes settled with as little distortion and injustice as may be; but the primary aim must always be to get the disputes settled.

It helps to visualize the problem if one distinguishes three types of dispute. Any one, or any two, or all three types together, may be involved in any given case. The simplest is the case of the man who refuses to do what he ought to: e.g., to pay his debt, or damages for harm done. On the criminal side, this is the case of the man who has, to our knowledge, committed a crime. (*See* CRIMINAL LAW.) The first question is what to do about it. In matters involving ownership of specific property our law attempts to restore it to the owner (as, e.g., stolen goods); or in the case of security for debt, to make it available to the creditor. But in most matters of contract and for most harms inflicted, our remedy is a judgment for damages. This is collectible by the sheriff seizing the property of the defendant and selling it at forced sale. The practical and technical difficulties of finding and realizing such assets are often extreme, and BANKRUPTCY affords a burdened debtor a chance to clear the slate and start afresh. Difficulties make it the clearer that what is needed in such cases is primarily speed and, among other things, low costs. Hence the common institution of special quick-moving courts for small cases (municipal and small courts) and the use of specialized tribunals, such as DOMESTIC RELATIONS courts and WORKMEN'S COMPENSATION commissions, when masses of cases of one particular kind keep coming up.

Much more difficult is the problem of dispute about the facts—about what the case really is. Here, chiefly, we find the need for *pleading* which is the set of devices for letting each party know what the other claims that the facts are, and each party may have opportunity to meet the contentions of the other. We use two types of tribunal to decide the facts: the JUDGE (or an official referee), in cases which historically belonged to the chancellor's court (contracts about land, injunction cases, divorce); the JURY, in the general run of cases on contract or harm done. The jury is often waived by both parties and the judge substituted. The jury at its best has the merits and defects of popular opinion. It will twist the law to its own notion of justice where the law is out of date; but it may also be biased where the plaintiff is pretty, or the defendant unpopular. But, especially in the cities to-day, the jury is not at its best, not being representative of the community. The judges' fear of juries being misled by irrelevant or prejudice-stirring matters has led to a highly technical and often unfortunate body of rules as to what evidence can or cannot be heard in court, and how that evidence must be presented. On the other hand, the only workable substitute for such arbitrary rules is sound discretion in a wise judge; and our combination of machine politics while insuring a democratic bar by making admission easy has given us judges in the trial courts whose wisdom is very often dubious and whose discretion is not trustworthy. Thus the technical rules remain. They not only often obscure the real dispute, but give trouble when the jury has reached its verdict. For a verdict can be upset on complaint of the loser if there was a slip in the correct procedure. Fortunately, our courts which review such matters are coming increasingly to use discretion in their own review and to disregard technical slips where substantial justice seems to have been done.

The third type of dispute assumes that the facts are clear, and raises the question: what is the right of the matter? It is less common than the others but more important because one decision on the law will apply to all similar cases, whereas the other two types affect directly only the two disputing parties. Our law attempts, therefore, to reserve decision in such cases to the judge, and to shape the pleadings—the parties' advance statement of their case—so that disputes of law can be separately treated. Moreover, it is the upper courts, always a group of skilled judges, which have the peculiar office of deciding questions finally.

But it is clear that these three problems of law administration get into one another's way. The first calls for speed, the last two for deliberation; the

second for clean-cut presentation of the facts; the third for knowledge of the law. Progress in law administration calls for machinery to sift each problem out from the others, and then for specialized appropriate machinery to handle what is shifted into each bin.

Vastly different from this primary function of law administration is that side of administration directed at regulating conduct in advance. On the dispute side, our law leaves all initiative to the interested parties and, save as to questions of what is right, handles the cases one by one. But in a changing and complex group, many things need to be dealt with in the large, and people who are either ignorant of the effects of their action or too intent on profit to attend to long range results, e.g., unsafe building construction or child labor, need to be checked up. Hence the vast spread of administrative machinery (such as commissions, bureaus, inspectors) in modern government laying down general regulations, to prevent accident or dispute, by making clear to the particular person concerned specifically and beforehand what his duty is. The court lets him act first (*see* INJUNCTION) and then pay if he was wrong. K. N. L.

LAW, PHONETIC. *See* PHONETIC LAW.

LAWES, LEWIS E. (1883-), American prison warden, was born at Elmira, N.Y., Sept. 13, 1883. He was educated at Elmira Free Academy and the New York School of Social Work. He began his prison experience in 1905 as a guard at Clinton prison and, after holding posts in the Auburn prison and the state reformatory at Elmira, he became superintendent of the New York City reformatory. In 1920 he was appointed warden of Sing Sing prison. Lawes's books include *Man's Judgment of Death,* 1923, *Life and Death in Sing Sing,* 1928, and *Twenty Thousand Years in Sing Sing,* 1932.

LAWES, SIR JOHN BENNET (1814-1900), English agriculturist, was born in Rothamsted, Dec. 28, 1814. He made a special study of chemistry at Oxford where he graduated in 1833, and in 1834 took up the management of his family estates. There he began investigating the chemical properties of plants and developed the first commercial fertilizers, which he began manufacturing in 1843. In addition he experimented in rotating crops and feeding livestock, and brought about remarkable improvements in British agriculture. Died at Rothamsted, Aug. 31, 1900.

LAW MERCHANT, originally the body of rules and customs developed by various merchant communities of Europe to govern mercantile transactions and administered by local courts of limited jurisdiction; in its modern sense, branches of the law which embody old merchant customs or arise from modern business conditions. The settling of disputes or problems by merchants, among and for themselves, led to the establishing of special courts whose aim was speedy justice and whose judges were bound to administer the law merchant alone. Such courts were the fair courts of France and Germany and in England the merchants' courts and piepowder (*pied poudre*—dusty foot) courts which were held in fairs and markets and where the litigants were usually tradesmen and peddlers. Until the 17th century the law merchant had little relation to COMMON LAW either in procedural or substantive rules. During the 17th and early 18th centuries, the common law and equity gradually assumed jurisdiction over the merchant class although the law was still administered as a body of customs. The law merchant passed into its third phase in the 18th century when Lord Mansfield (1705-93) incorporated into the common law a body of rules based on principles of public policy and merchants' customs common throughout Europe. His work was given further impetus in the United States by Chancellor Kent (1783-1847), and Justice Story (1779-1845). From the law merchant are derived the principles governing NEGOTIABLE INSTRUMENTS, PARTNERSHIP, agency, INSURANCE, TRADEMARKS and other branches of modern mercantile law.

C. F. WE.

LAWN BOWLS, an outdoor pastime that traces back to the 13th century and is still very popular in England, Scotland, Canada and in some sections of the United States. Lawn bowls is played on a bowling green of which there are two kinds, the level and the crown. Surrounding the green is a ditch, and beyond this a bank of turf. The green is divided into rinks, usually 42 yards long and from 18 to 21 feet wide. The bowls, of lignum vitae, are made with a bias so that they will curve as they roll. These are bowled at the jack, a ball of white earthenware from 2½ to 2¾ inches in diameter. The object of the game is to place the bowls as near the jack as possible and at the same time to knock away the bowls of opposing players.

In match games, a team consists of four rinks of four men each, or 16 in all. Each rink has a skip, or captain, who directs the play of his men, telling each where he shall place his bowls. In matches each man rolls two bowls; in friendly games, each has four. The rules of the sport are elaborate, and to become a good bowler requires much practice.

See J. A. Manson, *The Bowler's Handbook,* 1904.

LAWN MOWERS. The standard type of lawn mower is a two-wheeled hand-powered machine with a rotating blade geared to the wheels and cutting by a shearing action with a sharp fixed blade. Provision is made for the adjustment of the fixed blade for loose or close cropping and for adjustment of the rotating blade with relation to the fixed blade.

Gasoline-powered lawn mowers are used on larger estates, and an electric lawn mower, which cuts faster, crops closer and is specially designed to be used close to obstructions, is being used to some extent.

L. WR.

LAWN TENNIS. The game of lawn tennis, commonly known as tennis in America but always given its full appellation in England to distinguish it from the more ancient game of "real" tennis, or court tennis, as it is called in the United States, is of com-

paratively modern development. Its history dates from the invention, in the early '70s, by Maj. Wingfield of the British Army of a game played with a racquet and ball across a net on a court marked out in the shape of an hour-glass on a lawn. To this game he gave the curious name of *Sphairistike* and took out a patent on it in 1874. But while it is from this game of *Sphairistike* that lawn tennis immediately derives, its lineage carries back many centuries further. Real tennis, or court tennis, which has many common denominators with lawn tennis, was played as long ago as the 13th century in France, where it is known as the *Jeu de Paume,* or the game of hand. Some of its historians seek to connect it with a game called *Chigan,* which was played on horseback in Persia and Egypt in 500 B.C. as a variation of a game called *Savlajan,* which was probably the origin of polo.

Whatever the antiquarians may speculate to have been the antecedents of court tennis, or *Jeu de Paume,* it definitely has been established that this game has been played for seven centuries, and so lawn tennis, too, may be said to go back to the time of Chaucer and Gower. For, like court tennis, lawn tennis is played with a ball and racquet across a net on a rectangular court. The method of scoring is the same in both, points counting 15, 30, 40, etc., four points for a side constituting game and six games a set, except under certain circumstances, when deuce, advantage games and sets are played. While court tennis has confining walls which are in play, a much more highly detailed court, a more ingenious system of play, a richer nomenclature and other points of differentiation from lawn tennis, there can be no disputing the close connection between them and the derivation of the latter from the former. The game of *Jeu de Paume* was not always played with a racquet. As its name indicates, the ball originally was struck with the palm of the hand. The racquet came in probably not later than 1500, for Erasmus, in 1527, says in his *Colloquies,* "Reticulum (net or racquet) piscatoribus relinquamus: elegantius est palma uti," which shows that the racquet was in use at this time, though not universally so.

Introduction into the United States. The introduction of lawn tennis into the United States was almost simultaneous with its appearance in England. It is disputed whether the game in America was first played at Nahant, Mass., or at Staten Island, N.Y. Dr. James Dwight, known as the "father of American lawn tennis," and president of the United States Lawn Tennis Association for 21 years, recorded that to the best of his knowledge and belief the first *Sphairistike* set seen in the United States was brought over from England in July 1875 to his uncle, Mr. William Appleton, at Nahant. But Nahant's claim to being the scene of the first lawn tennis played in America is challenged by Staten Island. And Mr. Malcolm D. Whitman, former amateur champion of the United States in his book, *Tennis Origins and Mysteries: A Pilgrimage,* gives the priority to Staten Island after carefully investigating and sifting and weighing the evidence. According to the evidence, Miss Mary Ewing Outerbridge, an American girl, while spending the winter of 1873-74 in Bermuda, saw the game of *Sphairistike* being played by British officers, who had witnessed the demonstration of the game by Maj. Wingfield in England before it was patented and had brought over sets to Bermuda.

Miss Outerbridge was presented with a set by the officers and brought it to the United States early in 1874, the customs officials, it is claimed, registering it as the first set brought into the United States. A. E. Outerbridge, her brother, who was a director of the Staten Island Cricket and Baseball Club located at Camp Washington (now St. George), Staten Island, obtained permission from the club for his sister to lay out a court in a corner of the grounds shortly after her return, and there she played with her father and brother and a friend. E. H. Outerbridge, another brother, was largely responsible for the initiating of action that led to the formation of the United States National Lawn Tennis Association, in 1881, a year after the success of a tournament held at Staten Island had demonstrated the wide appeal and growing vogue of the game. R. S. Oliver of Albany was elected the first president at the organization meeting held in New York, and a national championship was started in 1881 which has been held annually ever since.

Changes in Game. The game as it is played to-day in practically every civilized nation of the world, is modeled closely after Maj. Wingfield's *Sphairistike.* Certain features of his invention, however, have disappeared in the process of standardizing the game and codifying its rules, a work in which the Marylebone Cricket Club of England and the All England Croquet and Lawn Tennis Club led the way. The court on which *Sphairistike* was played, as we have noted, was in the shape of an hour-glass, being broader at the ends than in the middle, where the net is strung. The service boxes were marked out on only one side of the court, the service being delivered always from the other side, as in court tennis. Also, instead of using the court tennis system of scoring, i.e., 15, 30, 40, etc., and playing for sets, the racquets system of scoring was employed, each winning stroke being counted as one point and 15 points constituting a game.

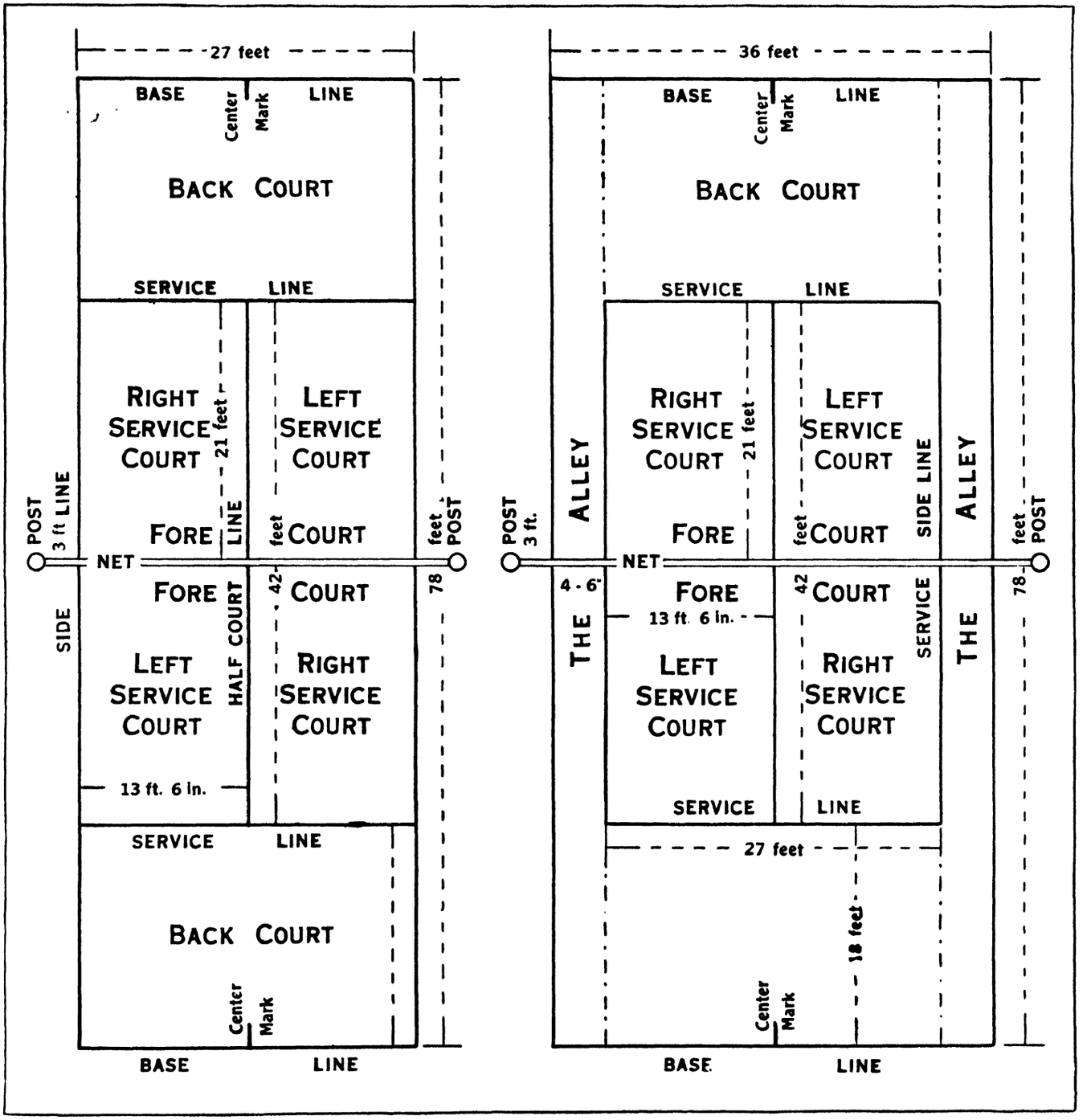
The Court and Implements. In its standardized form to-day, lawn tennis is played on a rectangular court measuring 78 feet in length and 27 feet in width. This is the singles court. The court for doubles, in which two play on each side, is 9 feet wider. The court is bisected by a net suspended from a cord or metal cable whose ends are attached to or pass over the tops of two posts, 3½ feet high, which stand 3 feet outside the court on each side. The height of the top of the net, which, along with the cord or metal cable, is covered by a band of from 2 to 2½ inches wide, is 3 feet at the center.

The boundaries of the court, usually marked in kalsomine, are known as the base lines (at the ends) and the side lines. At a distance of 21 feet from the net and parallel to it, service lines are drawn on each

side of the court, running the width of the singles court from side line to side line. The space between the net and service line, on each side of the net, is divided into two equal parts, or service boxes, by a line 2 inches in width running parallel to the side line and known as the center line, making 4 service boxes in all. Each service box measures 21 feet in length by feet in width. The area between the service line and the baseline on each side of the net is known as the back court, and each baseline is bisected by a line 2 inches in width and extending 4 inches up into the court, known as the center mark. The center mark, if continued to the service line, would join the center service line.

The markings of the doubles court are identically the same as for the singles, except that there is an extra line running the length of the court on each side, 4½ feet outside the side line of the singles court. The latter line becomes the service side line and need not be continued beyond the service line. The space between the service side line and the side line of the doubles court is known as the alley, on each side. The base lines are 9 feet longer, joining with the new side lines.

The ball is of the hollow, lively india-rubber variety, covered with tightly drawn flannel. It measures 2½ inches in diameter, weighs 2 ounces and has a rebound of from 53 to 58 inches when dropped 100 inches



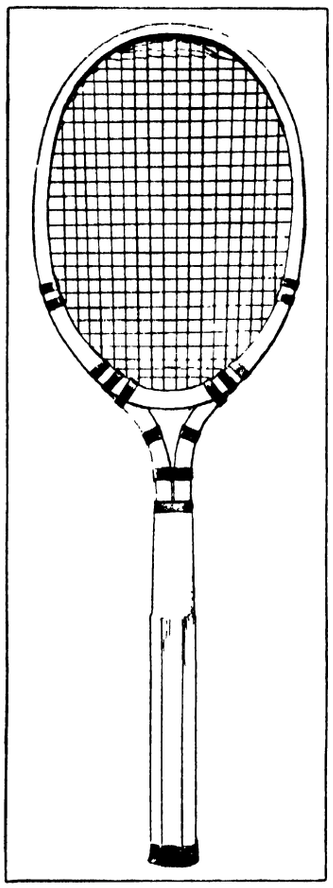
FROM SPALDING'S TENNIS ANNUAL

Singles *Doubles*

DIAGRAMS AND MEASUREMENTS OF TENNIS COURTS

upon a concrete base at a temperature approximating 68 degrees Fahrenheit. The racquet has a handle approximately 14 inches long, an oval-shaped head strung with gut or silk, and weighs, on the average, from 13 to 14 ounces, depending upon the age and size of the player and his individual needs.

The Play. When two players go on the court for a match of singles, one of them spins or tosses his racquet, and the other calls "rough" or "smooth" (the faces of the racquet), to determine which is to serve first. The winner of the toss elects either to serve or to choose the side of the court on which he will play, being influenced in his latter decision by the direction of the wind and the sun. Since the players change sides at the end of each odd-numbered game, i.e., the first, third, fifth, etc., the winner of the toss, if he elects to pick the side of the court, will choose the disadvantageous one, for after the first game he crosses over and plays two games on the favored side.



COURTESY A. G. SPALDING & CO.

A LATE MODEL TENNIS RACKET WITH OPEN THROAT

After the players have had a short practice session, the server starts serving from the right side of the center mark of the baseline, being restrained to keep both feet behind the baseline and one foot in contact with the ground until the ball is struck. He delivers the ball diagonally across the net to his opponent's, or the receiver's right service box. He must put the ball over the net to fall within the area of the service box and he has two serves in which to do it. If he fails on the first effort a fault is called and if the second serve also fails it is double fault and he loses the point, the score being love-fifteen or fifteen receiver. The service is delivered alternately from the right and left side of the center mark to the opponent's right and left service boxes. That is, after serving from the right side and the first point is won or lost, the server serves next from the left side.

There are various ways in which a point may be won or lost. You may win it (1) by making a service ace, a serve that your opponent is unable to touch; (2) by a placement, a stroke that lands within the lines of the court on your opponent's side beyond his reach; (3) by your opponent's error. An error is made when a player hits the ball into the net or outside the side or baselines, or when he makes a double fault.

The Strokes. The basic strokes of lawn tennis consist of the service, the forehand and backhand drives, the volley, the lob, the chop and the smash. Though in the early days of the game the underhand service was used and is still employed by some players to-day, the service is usually delivered overhead, the ball being thrown up in the air and struck above the head. There are several varieties. There is the flat service, hit with great speed and top spin; the slice service, on which the racquet cuts across the outer side of the ball at an angle to put spin on it, and the twist service, on which the strings are dragged or pulled across the ball with a sideward-upward movement of the racquet to cause the ball to hop or kick to the side after striking the ground.

The forehand and backhand drive are what are known as ground strokes. They are made in hitting the ball as it rises from the ground. The forehand is made on the right side and the backhand on the left side, the racquet being carried across the body. The volley is a stroke on which the ball is hit before it has touched the ground after leaving the opponent's racquet and is usually made close to the net. The lob is a high toss designed to sail over the head of your opponent and force him back from the net or to give you time to regain position in the center of the court; and the smash is the answer to the lob, an overhead stroke similar to the service. The chop stroke is a variation of the drive on which the racquet meets the ball at an angle, cutting across its surface to put side and back spin on it.

Outstanding Players. As it was in England that lawn tennis had its beginning, it was there that the first great players arose. Spencer Gore, winner of the first championship of England in 1877, was the first master of the volley and was followed a few years later by the Renshaw brothers, whose volleying and smashing made them the dominating figures of the game in singles and doubles for a long period. H. F. Lawford came to the fore to challenge the net play of the Renshaws with his back court driving style and to give the game the Lawford drive. From the two styles of the Renshaws and Lawford there developed the all-court game, embodying net attack built upon a sound foundation of the drive from back court.

The foremost English players since have been W. Baddeley; the Doherty brothers, Hugh and Reginald, who won the championship nine times between them; Dr. Joshua Pim; H. S. Mahoney; Arthur W. Gore; E. D. Black; H. Roper Barrett; Sidney H. Smith; J. Cecil Parke (of Ireland); Charles P. Dixon; A. R. F. Kingscote; Arthur H. Lowe, and more recently, H. W. Austin; Frederick J. Perry; G. P. Hughes; J. S. Perry and H. G. N. Lee. The foremost women players have been Miss Maud Watson, Miss L. Dod, Miss C. Cooper, Mrs. Hillyard, Miss Dorothea K. Douglass (Mrs. Lambert Chambers), Mrs. Kathleen McKane Godfree, Mrs. Phoebe Watson, Mrs. Eileen Bennett Whittingstall and Miss Betty Nuthall.

Richard D. Sears of Boston, who made many trips to England and was the first court tennis champion

of the United States, won the inaugural lawn tennis championship of the United States and held it for seven years, a record that has been equaled by only two other players, William A. Larned and William T. Tilden 2d. Sears possessed a game of all-round soundness and was one of the first to use the volley in the United States. After Sears as champion came Henry Slocum, Oliver Campbell, Robert D. Wrenn, Fred Hovey, Malcolm D. Whitman, William A. Larned, Hugh Doherty, of England, Holcombe Ward, Beals C. Wright, William J. Clothier, Maurice McLoughlin, Richard Norris Williams 2d, William Johnston, R. Lindley Murray, William Tilden, René Lacoste of France, Henri Cochet of France and John Hope Doeg. H. E. Vines, Jr., was champion in 1931 and 1932.

From 1881 to 1900, the greatest of the Americans were Sears, Campbell, Wrenn, Whitman, Ward and Dwight F. Davis. From 1900 on, Larned, Wright, McLoughlin, Johnston, Tilden, Williams and Vincent Richards have been outstanding. Tilden, winner of the championship from 1920 through 1925, and also in 1929, was probably the greatest master of the all-court game, if not the greatest of all American players. Williams was undoubtedly the most daring shot-maker. McLoughlin, with his meteoric style of smashing and serving, made the greatest appeal to the public until the appearance of Tilden, and Richards and Johnston have excelled as volleyers.

Outstanding among the women players of the United States have been Mrs. May Sutton Bundy, who won the English ladies' championship twice; Mrs. Molla Bjurstedt Mallory; Miss Mary K. Browne, and Mrs. Helen Wills Moody, the only other American to win at Wimbledon. Other famous American players have been Mrs. Hazel Hotchkiss Wightman, Miss Marie Wagner, Miss Eleonora Sears, Miss Evelyn Sears, Mrs. Maud Barger Wallach, Miss Helen Homans, Miss Elizabeth Moore, Miss Marion Jones, Miss Juliette Atkinson, Miss Mabel Cahill, Miss Bertha Townsend and Miss Ellen Hansell, winner of the first championship in 1887. More recently there have been Mrs. Marion Zinderstein Jessup, Miss Eleanor Goss, Miss Helen Jacobs, Miss Charlotte Hosmer, Mrs. Benjamin E. Cole, Miss Edith Sigourney, Miss Marjorie Morrill, Mrs. Lawrence A. Harper, Miss Edith Cross, Miss Penelope Anderson, Miss Sarah Palfrey and Miss Marjorie Gladman.

In 1900, Dwight Davis, who, with Holcombe Ward, originated the American twist service, offered a trophy bearing his name for an international team match to be played between England and the United States. Out of this dual competition for the Davis Cup has grown a world-wide championship that has attracted the entries of as many as 33 nations in a single year. Only four countries have won the trophy—the United States, England, Australia and France. The latter ended the United States' seven-year sway in 1927 and won the cup again in 1928, 1929, 1930 and 1931.

In 1923, Mrs. George W. Wightman of Boston put up an international trophy known as the Wightman Cup for a women's team match between England and the United States. It has been played for annually, alternately in the United States and England. Through 1932 the United States won the cup six times and England four times. A. DA.

LAW OF MULTIPLE PROPORTIONS. *See* DALTON'S LAW.

LAWRENCE, ST. (3rd century), Christian martyr, was born, according to Spanish claim, in Spain during the 3rd century. He is said to have been deacon of Pope Sixtus II and to have been martyred during the persecutions of the Emperor Valerian in 258. Many astonishing stories are told of his courage and good humor during the time of his martyrdom, and he is one of the most popular saints of both the Eastern and the Western Church. His day is Aug. 10.

LAWRENCE, ST. (c. 570-619), second Archbishop of Canterbury, was born in the second half of the 6th century. The source of knowledge about him is the Venerable Bede's *History*. According to this account, he was one of the missionaries who set out with St. Augustine in 595, and landed in Thanet 2 years later. St. Lawrence was made Archbishop of Canterbury, and died on Feb. 2, 619. His feast day is observed in England on Feb. 3.

LAWRENCE, ABBOTT (1792-1855), American merchant and diplomat, was born in Groton, Mass., Dec. 16, 1792. In 1814, he was taken into partnership with his brother Amos, forming the A. & A. Lawrence and Co., a commission house for cotton and woolen goods. Lawrence later aided in starting cotton manufacturing in Lowell, Mass., and helped in the financing of various New England railroads. He served two terms in Congress and in 1849-52 was U.S. minister to England. He established the Lawrence Scientific School of Harvard University. He died in Boston, Aug. 18, 1855.

LAWRENCE, AMOS (1786-1852), American merchant, was born in Groton, Mass., in 1786. He founded a dry-goods business in Boston which soon became the leading wholesale mercantile house in the country, and helped to promote cotton manufacturing in New England, especially in the vicinity of Lawrence and Lowell, Mass. He died in Boston, Dec. 31, 1852.

LAWRENCE, AMOS ADAMS (1814-1886), American philanthropist, was born in Boston, July 31, 1814, the son of Amos Lawrence. He engaged in textile manufacturing and other commercial activities, including the establishing of a hosiery mill at Ipswich, Mass. In 1854 Lawrence became interested in the New England Emigrant Aid Co., which sent 1,300 settlers to Kansas where the city of Lawrence was founded. He contributed toward the founding and support of Lawrence College, Appleton, Wis. He died at Nahant, Mass., Aug. 22, 1886.

LAWRENCE, DAVID (1888-), American journalist, was born in Philadelphia, Pa., Dec. 25, 1888, and graduated in 1910 at Princeton. He joined the Washington, D.C., staff of the Associated Press, and at the outbreak of the World War was put in charge

of the news concerning neutrality and relations with Germany. In 1919 he became President of the Consolidated Press Association at Washington and in 1926 President of the United States Daily. Lawrence wrote *The True Story of Woodrow Wilson*, 1924, and *The Other Side of Government*, 1929.

LAWRENCE, DAVID HERBERT (1885-1930), English writer, was born in Eastwood, Nottinghamshire, Sept. 11, 1885. He was educated at the Nottingham High School and University College in that city. He began to write early, publishing his first novel, *The White Peacock*, in 1911. Lawrence became profoundly interested in psychoanalytical study and is best known for his novels based on the analysis of sex psychology, notably *Sons and Lovers*, 1913, *The Rainbow*, 1915, *Women in Love*, 1921, *Aaron's Rod*, 1922, *The Plumed Serpent*, 1926, *Lady Chatterley's Lover*, 1929, and *The Virgin and The Gypsy*, posthumously published in 1930, and *Apocalypse*, 1932. He wrote three plays, *The Widowing of Mrs. Helroyd*, *Touch and Go*, and *David*, also several volumes of essays and studies, including *Twilight in Italy*, 1916, *Sea and Sardinia*, 1921, *Fantasia of the Unconscious*, 1922, *Studies in Classic American Literature*, 1923, and *Mornings in Mexico*, 1917. Many of his poems are included in *Amores*, 1916, and *Look! We Have Come Through!* 1917; his collected poems were published in 1928. Lawrence died near Nice, France, Mar. 4, 1930.

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LAWRENCE, JAMES (1781-1813), American naval officer, was born in Burlington, N.J., Oct. 1, 1781, and at fourteen entered the navy. He took part in the war with Tripoli (1804-05), being one of Decatur's party which burnt the *Philadelphia*, held by the pirates in the harbor. He was successively second in command of the *Constitution*, and commander of the *Argus*, *Vixen* and *Wasp*. In 1811 he was promoted to captain, commanding the *Hornet* at the beginning of the War of 1812, and in 1813 was given command of the *Chesapeake*. On June 1, 1813, he attacked the British frigate *Shannon* off the North American coast, and during the sharp and bloody fight was wounded and the ship taken. When being carried away, he uttered the famous words, "Don't give up the ship." He died in Halifax, June 5, 1813.

LAWRENCE, SIR THOMAS (1769-1830), English portrait painter, was born at Bristol, May 4, 1769. He showed a precocious talent for drawing and at the age of 10 was supporting his family by his crayon sketches of notable visitors at Bath. He went to London in 1787 and became painter to the king upon the death of Sir Joshua Reynolds. Lawrence was the fashionable portrait painter of the age and his sitters included all of English society and many of the crowned heads of Europe. Perhaps his best portrait, that of Mrs. Siddons, is in the National Gallery, London. His early work is distinguished by a febrile, superficial brilliancy, which he soon lost. The flimsiness of his later canvases marks not only the decline of the man but of his school. Lawrence died in London, Jan. 7, 1830.

LAWRENCE, a city in northeastern Kansas, the county seat of Douglas Co., situated on the Kansas River, 47 mi. southwest of Kansas City. Three railroads, bus lines and an airport serve the city. Lawrence is a market and shipping point for grain, legumes and garden crops, as well as for paper, flour and canned goods manufactured in the city. In 1929 the factory output reached about $4,000,000; the retail trade amounted to $10,460,949. Lawrence is the seat of the University of Kansas, established in 1866, with an annual enrollment of about 5,000 students. Haskell Institute for Indians, under Government administration, is also located here. The city was settled by New England Abolitionists in 1854, and at first was known as Wakarusa. At that time the Kansas Territory was the scene of fiery attacks and counter-attacks between the pro- and anti-slavery parties, and is associated with the name of John Brown and the so-called Wakarusa War. Lawrence was chartered in 1858. Pop. 1920, 12,456; 1930, 13,726.

LAWRENCE, a city in eastern Massachusetts, the county seat of Essex Co., situated on the Merrimac River, 26 mi. north of Boston. It is served by the Boston and Maine Railroad and bus lines. There is an airport. Lawrence is a leading manufacturer of worsted cloth, its total production averaging about two-thirds of the annual factory output. The total value of manufactures annually reaches about $175,000,000, including the production of cotton goods, shoes, paper and wood pulp, carpets, textile machinery and other products.

Lawrence was founded in 1845 and was named after Abbott Lawrence. It was incorporated in 1853. Its public buildings face a 20-acre common. In 1848 a great dam was completed, and canals were added to this engineering feat. Three periods saw Lawrence's population doubled, those from 1850 to 1860, from 1860 to 1880, and from 1880 to 1910. Lawrence has annexed part of Andover on its south. Pop. 1920, 94,270; 1930, 85,068.

LAWRENCE COLLEGE, a coeducational institution at Appleton, Wis., privately controlled and affiliated with the Methodist Episcopal Church was founded in 1846. It was named for its benefactor, A. A. Lawrence of Boston. The college had an endowment fund in 1930 of $1,726,409. The library contained 52,000 volumes. In 1930 there were 876 students in the Liberal Arts and 303 in the Conservatory of Music and a total faculty of 74, headed by Pres. Henry W. Wriston.

LAWRENCE O'TOOLE, ST., or Lorcan Va Tuathail, (c. 1128-80), Irish confessor, was born about 1128 in Kildare. He was appointed Archbishop of Dublin, 1162, and his historical significance rests on the fact that he was the first Irish-born archbishop. His appointment marked the end of the Danish ec-

clesiastical supremacy. He died at Eu in Normandy, Nov. 14, 1180, and was canonized by Pope Honorius II in 1225.

LAWRENCEVILLE, a city in southeastern Illinois, the county seat of Lawrence Co., situated on the Embarras River, eight mi. west of Vincennes, Ind. Bus lines and two railroads afford transportation. Oil, coal and gas are found near by. Grain is the chief crop of the district. The city has oil refineries, cooperage plants and other industrial establishments. Lawrenceville was founded in 1821. Pop. 1920, 5,080; 1930, 6,303.

LAWRENCEVILLE SCHOOL, a private institution for secondary education of boys at Lawrenceville, N.J., was established in 1810 as a private high school. It was reorganized by means of a bequest from John C. Green, an alumnus, in 1881, and was chartered under its present title as an endowed preparatory school. Its plan of operation is patterned after the English House system. Though non-sectarian, the school has Presbyterian affiliations. The school has an endowment of $300,000. There are approximately 430 students annually, and a faculty of 55.

LAWSON, ERNEST (1873-), American painter, was born in California in 1873. He studied in Kansas City, at the Art Students' League in New York and in Paris. One of the foremost American landscape painters, Lawson has exhibited in the leading cities of the United States. He is represented in the Corcoran Gallery, Washington; Metropolitan Museum, New York; Brooklyn Museum; Los Angeles Museum; National Gallery, Washington; City Art Museum, St. Louis; and elsewhere.

LAWSON, HON. HARRY SUTHERLAND WIGHTMAN (1875-), Australian statesman, was born at Dunolly, Victoria, Mar. 5, 1875. Educated in Australia at the University of Melbourne, he became one of the most distinguished members of the Australian bar. He was elected mayor of Castlemaine in 1905-06, and senator for the state of Victoria in 1928.

LAWSON, VICTOR FREMONT (1850-1925), American newspaper publisher, was born at Chicago, Ill., Sept. 9, 1850. In 1876 he bought the Chicago *Daily News.* Five years later Lawson launched a morning edition, the *Record,* and in 1901 merged it with the *Times-Herald,* and later with the *Inter-Ocean.* He helped organize the Associated Press, of which he was president (1894-1900). He was a leader in the movement for a U.S. Postal Savings Bank. He died at Chicago, Aug. 19, 1925.

LAWTON, a city and the county seat of Comanche Co., situated in southwestern Oklahoma on Cache Creek, about 90 mi. southwest of Oklahoma City. The region produces live stock and farm crops, especially cotton. The local retail business in 1929 was valued at $9,746,918. Oil fields are found east of Lawton. Near the city are located a branch of the State Agricultural College and also Fort Sill Military Reservation, including an airport and field artillery school. Wichita National Forest is in the vicinity. Lawton was founded and chartered in 1901. Pop. 1920, 8,930; 1930, 12,121.

LAWYER, an officer of the courts who is sworn to uphold the law. In the United States he is required to have at least a general secondary education and a recognized course of legal study, after which he must pass an examination for admission to the bar given by a board appointed by the highest court of the state. Lawyers may specialize in patent, marine, corporation or other branches of the law, or they may enter general practice.

Lawyers should possess a sound business judgment, and be able to examine, appraise and correlate facts, as well as give rational expression to them. Lawyers occupy many of the elective offices of civil trust in the United States, and the occupation is one that leads to positions of the highest responsibility and reward. N. O. R.

LAXATIVES. *See* CATHARTICS.

LAYAMON (fl. 1200), Early English poet, was the author of the *Brut,* a lengthy chronicle of Britain, containing 32,250 lines. Nothing is known of his life other than through scattered references in the MSS. of the poem. These indicate that Layamon was a priest of Ernley, identified as the modern Areley Regis, or Areley Kings, in Worcestershire, and that he was the son of Leuca or Leovenath. Layamon's *Brut* is admittedly a paraphrase of Robert Wace's *Brut d'Angleterre.* It is more important as a reference than for its literary value, as it shows the transition from Old English to Early English. *See also* ENGLISH LITERATURE.

LAYARD, SIR AUSTEN HENRY (1817-94), English archeologist and diplomat, was born at Paris, Mar. 5, 1817. After a boyhood spent in Italy he studied law in London. Between 1840 and 1849 he made remarkable archeological discoveries at Nimrod, the site of ancient Nineveh which included cuneiform inscriptions and the famous human-headed winged bulls and lions and eagle-headed gods. He served as minister to Spain (1869-77) and as ambassador to Constantinople (1877-80) and published many books on Assyrian art and archeology. He died at London, July 5, 1894.

LAY BROTHERS, religious who reside in monasteries or religious houses, as members of their respective orders, but who do not take Holy Orders or teach, devoting themselves entirely to manual labor or secular affairs. They wear habits distinguished from those of the choir-religious, and usually occupy separate quarters in the monastery. They are mostly drawn from the working-class, their chief qualifications being skill in manual work rather than education. The practice of admitting lay brothers seems to have originated in the 11th century. Lay sisters occupy positions in convents similar to those of lay brothers in monasteries. *See* MONASTICISM.

LAZAREV, PETR PETROVICH (1878-), Russian physicist, was born at Moscow, Apr. 1, 1878. In 1907 he taught at the University of Moscow, becoming a professor of physics at the technical college

in 1912 and member of the Russian Academy of Sciences in 1917. He made researches in photochemistry and various biochemical problems, propounding a theory of ionization to account for sensation and central nervous activity. He was appointed chief of the Kursk Magnetic Geophysical Survey in 1918.

LAZARUS (from the Hebrew for *He whom God has helped*), the name of the beggar in the New Testament parable, Luke 16:20, used in illustration of the dangers of wealth. In medieval times Lazarus was supposed to be a leper, and the name Lazar came to be synonymous with this term.

LAZARUS, EMMA (1849-87), American Jewish poetess and writer, was born at New York in 1849. A zealous student of Hebrew and Jewish literature, she first gained recognition through her *Poems and Translations,* 1867, which the great poet WILLIAM CULLEN BRYANT praised. She further distinguished herself through her admirable English translation of the *Poems and Ballads of Heinrich Heine,* 1881. RALPH WALDO EMERSON greatly influenced her in previous years through his works and his character. One of her most interesting poems has as its subject the oldest Jewish cemetery in the United States, that at Newport, R.I., established in 1677. Others have as their theme the 1881 persecutions of the Jews in Russia and the religious, national consciousness of the Americanized Jews. Her later poems include: *The Banner of the Jew, By the Waters of Babylon, An Epistle to the Hebrews* and *Songs of a Semite.* Other works were *Phantasies, Epochs, The Choice* and *The New Ezekiel.* She also translated into English some of the works of the Hebrew poets of medieval Spain, using the German translations by Michael Sachs and Abraham Geiger as a basis. She died at New York in 1887. In May 1903 a memorial tablet in her honor was affixed to the Statue of Liberty, in New York Harbor. A. SH.

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LAZURITE, a beautiful blue mineral, the principal constituent of LAPIS LAZULI. Lazurite is a complex sulpho-chloro-silicate of sodium, calcium and aluminium, crystallizing in the ISOMETRIC SYSTEM. In the finer forms of lapis lazuli lazurite is popular as a semi-precious stone.

LEACHING, in geology, the action of surface water in removing soluble material from the near-surface portion of an ORE DEPOSIT, often producing a GOSSAN. In ORE TREATMENT, copper is dissolved, or leached from weathered ores with dilute sulphuric acid; gold and silver are leached from their ores by cyanide solution. *See also* CYANIDE PROCESS; WEATHERING; ENRICHMENT, SECONDARY.

LEACOCK, STEPHEN BUTLER (1869-), Canadian author and educator, was born at Swanmoor, Hampshire, England, Dec. 30, 1869. He was educated at the universities of Toronto and Chicago. From 1891-1903 he taught at Upper Canada College and at the University of Chicago, and later headed the Department of Political Economy at McGill University, Montreal. Leacock is a well-known humorous writer, his most popular works including *Literary Lapses, Nonsense Novels* and *Frenzied Fiction.*

LEAD, a soft, heavy ductile element with blue-gray luster known since early historic times (Latin, *plumbum,* symbol Pb). Commercial pig lead (purity 99.91 to 99.99%) has the following properties: atomic number, 82; atomic weight, 207.22; density, 11.34; melting point, 327.4° C.; valence, 2 or 4.

It commonly acts as a basic element forming salts with acids, but it may also act as an acid to form plumbites and plumbates with bases. The metal tarnishes in air. Ordinary water has little continued action on lead because a protective coating forms which prevents further action. Lead resists the action of sulphuric acid up to nearly its boiling point; dilute nitric or strong hydrochloric acids dissolve lead. Lead mixes easily with most other metals forming well-known alloys, such as solder, bearing metals, type metals, etc. The best known compounds of lead are the oxides; litharge PbO, used in oil varnishes; red lead Pb_3O_4, used in making red paint; the basic carbonate or white lead 2 $PbCO_3$.Pb $(OH)_2$, used for white paint manufacture; the acetate, sugar of lead, $Pb(C_2H_3O_2)_2 \cdot 3H_2O$; and lead chromate (chrome yellow), $PbCrO_4$. It occurs in many parts of the world as the sulphide galena. Production in 1929 was 690,000 tons in the United States, while that of the world totaled about 1,900,000 tons.

The salts of lead are poisonous and the ingestion of even small amounts in industry is a constant hazard (e.g., painter's colic). The chief preparation used in medicine is solution of lead subacetate, which is used as an astringent in inflammatory conditions of the skin and at times as an application to sprains and bruises. Due to its poisonous character it must not be applied to denuded surfaces.

Lead unites with a variety of metals as antimony, bismuth, copper and tin, forming many useful alloys. Type metal is an alloy of lead and antimony; bismuth and lead form an alloy with a low melting point; solder is an alloy of lead and tin; pewter is an alloy of lead, tin and antimony. *See also* WHITE LEAD. G. W. T.; P. N. L.

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LEAD, a city in Lawrence Co., western South Dakota, situated in the Black Hills, in an important gold mining region. It is served by two railroads. The Homestake Mining Co. controls the largest interests in the vicinity, employing in 1931 about 1,750 men. Lead was settled by prospectors in 1876 and was chartered as a city in 1890. Pop. 1920, 5,013; 1930, 5,733.

LEADING TONE, in music, the name of the seventh degree of any scale, so called because of its tendency to pass up to, or lead into, the eighth degree of the scale or the octave. Thus B is the leading tone in the scale of C, F♯ in the scale of G, and so on. It is to be distinguished from the seventh occurring in a chord of the seventh, since this tone leads downward.

LEAD POISONING or **PLUMBISM.** Lead may enter the body through the lungs by the inhalation of dusts or vapors, through the gastro-intestinal tract from the swallowing of entrained dust or larger particles, and from the imbibition of lead-containing fluids. Some organic lead compounds may enter the body, in harmful amounts, through the portal of the skin.

Lead poisoning is most frequently observed following exposure in lead using industries, leading to an occupational disease. No less than two hundred distinct trades or industries extensively use lead. The following occupations are common sources of lead poisoning: Storage battery manufacture, painting, white lead manufacture, and lead mining and smelting.

Lead poisoning has been observed in children due to the eating of paints from nursery walls, furniture, toys, etc. Drinking water passing through lead pipes or originating in lead deposits has been the source of lead poisoning.

Susceptibility to lead poisoning varies appreciably in persons equally exposed. So small a quantity as one milligram daily may lead to lead poisoning after extended exposure, but much larger amounts have caused no obvious impairment in others. The degree of solubility influences the probability of lead poisoning after lead intake, but no form of lead is to be regarded as entirely innocuous. Lead poisoning may manifest itself as an acute or chronic disease, or in permanent impairments resulting from the previous action of lead no longer remaining in the body.

The typical case of lead poisoning begins with some such features as constipation, headache, loss of appetite, foul tastes in mouth, pallor, loss of strength in muscle groups, such as forearm or lower leg, abdominal pain, cramps in muscle groups, such as those of lower extremities. A more advanced stage of the disease may present an accentuation of all of the foregoing, notably the abdominal pain, the anemia, and the muscle weakness, culminating in wrist or ankle drop, together with nephritis, profound blood changes, cachexia, involvment of the liver (hepatitis), and rarely lead mania (encephalitis). Atypical cases of lead poisoning may involve almost any portion of the body, such as the parotid glands, simulating mumps; the testes, simulating orchitis; and the optic nerve, leading to blindness. Usually these rarer features are associated with some of the more common and characteristic manifestations. (*See also* CHILDREN, DESEASES OF: Prenatal Diseases).

Occupational lead poisoning is subject to industrial compensation in the following states and possessions of the United States: California, Connecticut, Hawaii, Illinois, Massachusetts, Minnesota, New Jersey, New York, North Dakota, Ohio, Philippine Islands, Porto Rico, Wisconsin. Federal employees (U. S.) are likewise covered wherever employed. In some other states, peculiar interpretation of laws and jury decisions may provide compensation for this condition.

C. P. McC.

LEADVILLE, a city and famous mining center in central Colorado, the county seat of Lake Co. It is situated two miles above sea-level, at the head of the Arkansas River valley, 170 mi. by rail southwest of Denver. Two railroads serve the city and there is an airport. In 1859 placer gold was discovered in this region, then known as California Gulch. The gold was soon exhausted, and the community shrank. In 1874 A. B. Wood found silver-lead in the abandoned haunts of the gold-miners, and the second boom was greater than the first. The town was named Leadville and incorporated in 1878. In 1880 the city had over 15,000 people and produced $15,000,000 worth of gold, silver and lead. Silver fell in 1893, and from 1900 to 1915 zinc was the leading interest. Pop. 1920, 4,959; 1930, 3,771.

LEAF, in botany, an outgrowth, varying greatly in form, produced from the growing point of a stem. In green plants the leaf is concerned with the process of making food, in which light is used to bring about the combination of water and carbon dioxide by the green pigment, chlorophyll. The leaf blade provides much green tissue for the absorption of light and the leaf-stalk or petiole favors adjustment of the blade to the light. There is also a system of veins which conduct water to and food from the internal cells (mesophyll) containing the chloroplasts or small bodies where the green pigment occurs. The upper mesophyll layer (palisade) is compact, the lower is loose with many air spaces. This tissue is protected against excessive evaporation by an epidermis layer on both upper and lower surfaces. Minute pores, or stomata, commonly more frequent in the lower epidermis, allow gaseous exchange between the outer atmosphere and the air spaces in the leaf.

The veins in intimate contact with mesophyll cells, assume various arrangements related to the numerous forms that leaves assume, as parallel in monocotyledon leaves (grasses), net-veined in dicotyledons, which may be pinnately arranged as in locust or palmately as in geranium.

Leaves may further be classified according to form as simple (lilac) or compound (rose), depending on whether the blade is in one piece or divided into a number of leaflets; according to duration, as deciduous, lasting but one season, and evergreen, with no regular annual leaf fall, as in pines and rubber plant. Evergreen leaves in temperate and cold climates are usually needle-like leaves with heavy surface layers, much reduced in extent, capable of resisting winter conditions.

N. E. P.

LEAF-HOPPER, a group term for a large class of slender, active bugs of the order *Homoptera.* They attack cultivated plants, especially grape, roses and apple. The largest species are about a quarter of an inch long; the smallest a tenth of an inch. In spring the adults emerge from hibernation and lay abundant eggs on the under sides of the leaves. The nymphs feed there and may be destroyed by nicotine sulphate or kerosene emulsion sprayed from below upward. The adults are powerful leapers and flyers

so are hard to control. A species which attacks beets may be caught on tarred boards dragged between the plant rows.

LEAF INSECT or walking leaf, a popular name for various tropical species of *Phasmidæ,* mostly natives of India. They belong to the order *Orthoptera.* Though large, they are difficult to see because their wings are colored and veined like leaves, and they remain motionless in the presence of enemies. When resting, their legs resemble leaf stalks. They feed on foliage. Our "walking sticks" are near relatives.

LEAGUE OF NATIONS, an association of governments which was established by the peace treaties of 1919-20. It has a constitution of 26 articles, called the Covenant. Its capital is Geneva, Switzerland, and its annual budget ranges between four and five million dollars. With the admission of Mexico in September, 1931, the League has 56 members; the principal states which are not League members are Soviet Russia and the United States. These nonmember states nevertheless cooperate in many activities. There are four main organs of the League: the Assembly, the Council, the Secretariat and the Technical Organizations and Advisory Committees. The Assembly consists of representatives of all the members of the League and meets annually in September. One special session—in March, 1926—has also been held when Germany applied for admission. The Assembly reviews the work of the multifarious organs of the League and adopts resolutions laying down general principles for these organs to follow. Among its important tasks are (a) voting the League budget and electing Council members and, concurrently with the Council, judges of the Permanent Court, and (b) acting on matters pertaining to international justice, the Assembly dealing with any matter affecting the peace of the world.

The Council is a smaller body which holds four regular sessions a year. At present it consists of five permanent members—the British Empire, France, Italy, Japan and Germany and nine nonpermanent members. Each year the Assembly elects three nonpermanent members for a term of three years. Through rotating the position of nonpermanent members, virtually every state may secure representation at some time or another upon the Council. At present the smaller powers outnumber the Great Powers on both the Council and Assembly. As a rule, however, action cannot be taken except by unanimous vote. If one may compare the Assembly to the general meeting of stockholders of a corporation, the Council may be said to be the Board of Directors. It supervises the many administrative activities of the League. It has a number of special functions, such as watching over the League of Nations mandates, and colonial territory put under League supervision by the peace treaties. It draws up plans for disarmament; and may enforce the treaty rights of minorities. The presidency of the Council changes at each session according to the alphabetical order of the names of the states represented.

The third organ of the League is the Secretariat. Composed of nearly 700 persons from 51 countries, the Secretariat is a vast international civil service, headed by a Secretary-General. It is divided into 11 main sections, such as the political section, and the mandates section, each of which is engaged in studying problems upon which the Assembly and Council may act. One of the duties of the Secretariat is to register and publish all treaties, which members are obliged to send to the League. About 2,500 treaties have been registered during the last 11 years.

In addition to these three main bodies, the League has a number of Technical Organizations and Advisory Committees. Thus, there is the Economic and Financial Organization, the Organization for Communications and the Health Organization. Each organization consists of experts—some of whom act in an independent capacity, others as representatives of governments. Each organization deals with specific problems and may give governments expert advice. It was the Financial Organization which brought about the financial reconstruction of Austria and Hungary. The most important advisory committees are the Mandates Commission, the Advisory Committee on Opium, the Committee for the Protection of Children and Young People, and the Committee on Intellectual Cooperation. While these committees are permanent, other committees, such as the important Preparatory Commission for the disarmament conference, are temporary. Finally there is a League Commission which will govern the Saar until 1935, and a League Commissioner who administers Danzig. The Technical Organization and Advisory Committees report to the Council.

The main purpose of the League of Nations is to prevent the outbreak of war. According to Article 11 of the Covenant any war or threat of war is declared a matter of concern to the entire League; moreover it is the friendly right of each member of the League to bring to the attention of the Assembly or the Council any circumstance whatever affecting international relations which threatens good understanding between nations. Moreover, if two League members engage in a dispute which threatens to lead to war they promise to submit the question to arbitration or to enquiry by the Council. If they agree to arbitrate they promise in advance to accept the award. But if they take the other alternative, they are not obliged to abide by the recommendations of the League Council; nevertheless, if the recommendation of this latter body is unanimous except for the parties, the members of the League promise not to go to war with any party to the dispute which accepts the recommendation. In case of disagreement within the Council, the disputants may go to war after three months. About 30 disputes have been brought before the League, the most important being the Greco-Bulgarian dispute of 1925 and the China-Japan dispute of 1931-32. Thus, under the League Covenant, the Council and the Assembly may act as a body of conciliation to prevent war from breaking out in any

part of the world. Any state in fear of attack may send a telegram to Geneva, whereupon an emergency meeting of the Council may be called.

In case a state violates its obligations and illegally goes to war, the Covenant provides for certain sanctions. According to Article 16 the members of the League undertake to apply against such a state an economic blockade. Moreover, the League Council may recommend what military forces the members should contribute. Thus the Covenant provides for cooperative police measures against an aggressor. In the ten years of its existence, however, the League has not attempted to apply these sanctions. It has relied only on moral suasion to prevent nations from going to war.

The second major purpose of the League is to remove the underlying causes of disputes between nations and to organize the world for peace. Thus, the League has attempted to secure international reduction of armaments—a conference for this purpose being called at Geneva in Feb., 1932. Much of the time of the various technical organization of the League, the Assembly and the Council, is devoted toward the formulation of new principles of international conduct which will reduce clashes between national interests. These bodies are constantly drafting new treaties which when ratified constitute a new part of the body of INTERNATIONAL LAW. For example, treaties providing for the reduction of CUSTOMS DUTIES, the limitation of armaments or the settlement of international currency questions may be included. The League of Nations is not a superstate; no government can be forced to accept a treaty. The League simply provides new methods of international cooperation.

While the making of new international law is of great importance, it is equally desirable, from the standpoint of world peace, to bring about the peaceful revision of existing agreements which are patently unjust. For example, Germany has protested against some of the provisions of the Treaty of Versailles, while China complains of certain agreements with Japan. Realizing that it is unjust to take away the right to go to war without at the same time providing for some peaceful means of changing the *status quo,* the League Covenant in Article 9 authorizes the Assembly to advise from time to time the reconsideration of international conditions whose continuance might endanger the peace of the world. The League has no power to compel a member state to consent to treaty revision. The exercise of such a power in case it existed might arouse as much ill-will as it would cure. The League merely gives advice, upon the basis of which public opinion may agitate for a voluntary change. It has made little use of Article 19, but has concentrated its efforts upon preventing wars from breaking out. Nevertheless, the future of the League may ultimately depend upon its capacity to bring about the peaceful solution of the underlying disputes which have been responsible for the outbreak of war in the past. R. L. BU.

LEAGUE OF THE THREE EMPERORS, an understanding as to policy arrived at in a meeting at Berlin, Sept. 1872, between Tsar Alexander II of Russia, William I of Germany and the Emperor-King, Francis-Joseph of Austria-Hungary. It involved explanations of foreign policies and a general understanding on them, without formal written agreements. The accord remained intact for some years despite the fact that the rulers of Russia and Austria-Hungary reached a special understanding in 1879. Even after the rift in the friendship between Germany and Russia following the CONGRESS OF BERLIN it was revived with Alexander III as Tsar. A formal secret treaty was signed in June 1881 in which it was agreed that if one Power found itself at war with a fourth power the others would observe benevolent neutrality and try to localize the conflict. The second article provided that modification in the territorial *status quo* of Turkey in Europe should take place only by virtue of a common agreement. Article III confirmed "the European and mutually obligatory character of the principle of the closing of the Straits." Other matters of minor importance were cared for in a protocol signed at the same time. With the development of the TRIPLE ALLIANCE between Germany, Austria-Hungary and Italy the Emperor's League disappeared.

LEAMINGTON, a municipal borough and health resort of Warwickshire, England, situated on the Leam 98 mi. northwest of London. During the 16th century Camden discovered its saline springs, but the baths were not erected until the latter part of the 18th century, and only in 1838 did the town become fashionably popular as a result of being created by royal licence Royal Leamington Spa. It is a pleasant residential town, with beautiful public gardens, a fine town hall, Royal Pump room, and many modern churches and public buildings. Hawthorne wrote his *English Notes* while at Leamington, and the town is mentioned by Thackeray and Dickens. An oak surrounded by rails is locally considered to mark the exact center of England. Leamington is largely given over to the interests of a spa, but there are brickworks and iron foundries in the vicinity. Pop. 1931, 29,000.

LEANDER, in Greek mythology, a youth of Abydos, the lover of HERO.

LEANING TOWER OF PISA, the campanile of Pisa Cathedral, Italy, which inclines over 16 ft. out of the perpendicular in its height of 179 ft. It is built of white marble. Six of its eight stories possess colonnades, and the entire structure is topped by the bell tower, considerably smaller in diameter than the tower proper. The sharp incline is attributed by many observers to sinking of the foundations on the south side in the course of building, so that an inclination was given in the opposite direction. According to the law of statics, such a leaning tower has stability if the parts are firmly bound together, and the center of gravity does not project beyond the limits of the foundation. A flight of 296 steps leads to the top of

the tower, which embraces a beautiful view of the sea and of the town with its Alpian background.

LEAP YEAR, a year containing 366 days, designated as any year whose number is divisible by four. If, however, the number of a year is divisible by 100, it must be also divisible by 400 to be a leap year. Thus, for example, the years 1600 and 1904 were leap years; 1900 and 1903 were not. The addition of an extra day each four years is necessitated by the fact that the solar year exceeds 365 days by about 6 hours.

LEAR. *See* KING LEAR.

LEAR, EDWARD (1812-88), English humorist and artist, was born in London, May 12, 1812. At an early age he showed ability as a painter and achieved considerable success as an artist of birds and landscapes. He published several illustrated travel books and did illustrations for the scenic sketches of Tennyson's poems, but his reputation rests chiefly on his nonsense rhymes and illustrative drawings which appeared in the collections, *Nonsense Songs and Laughable Lyrics.* Lear died in San Remo, Italy, Jan. 30, 1888.

LEARNED SOCIETIES. Societies of individuals interested in the promotion of some aspect of intellectual or artistic interests have probably always existed. They began to flourish particularly in the late Greek period, usually under the name of academy, a term originally applied to Plato's school. A few academies existed in the Middle Ages, the most famous being the Academy of Floral Games founded at Toulouse about 1325 as a part of the Troubadour movement. Their number began to flourish during the Renaissance period under the patronage of the wealthy aristocracy for the encouragement of studies which could find no acceptance in the universities. The earliest was the Platonic Academy founded at Florence in 1474 by the Medici and dissolved in 1521. The Academy of Florence, 1540, was devoted to the study of Italian writers as was also the *Accademia della Crusca,* 1582. *Die Fruchtbringende Gesellschaft* was created at Weimar in 1617 for the promotion of German culture. The French Academy was chartered in 1635, six years after its organization, under the patronage of Richelieu and Louis XIV, as a sort of high court of letters. Other academies of this and the following century were incorporated as part of the Institute of France in 1793, which includes the French Academy, the Academy of Belles Lettres, the Academy of Sciences, the Academy of Fine Arts, and the Academy of Moral and Political Sciences.

Scientific Societies. The interest in science, not shared by the universities, in the 16th century led to the formation of societies for its encouragement. Of these the earliest was the *Academia Secretorum Naturae* founded at Naples in 1560, followed in 1603 by the *Academia de' Lincei.* The *Accademia del Cimento* at Florence, 1657-67, was established to conduct experiments. In France the Academy of Sciences was chartered in 1666 with sections for the various sciences. The *Academia Naturae Curiosorum* or Leopoldine Academy at Leipzig, 1651-52, and the *Collegium Curiosum* at Altdorf, 1672, were the forerunners of the Royal Academy of Sciences which was established at Berlin in 1700 by Frederick I at the suggestion of Leibnitz, who also stimulated the creation of the Imperial Academy of Sciences at St. Petersburg, 1725. In England the Royal Society grew out of meetings begun in 1645 at Oxford and London of a group interested in scientific experiments and was chartered in 1662. Other famous scientific academies sprang up in Europe in the 18th century: the Academy of Sciences, later the Royal Swedish Academy, 1739; the Royal Academy of Copenhagen, 1742; the Royal Academy of Sciences of Turin, founded in 1757 and given royal sanction in 1783. In the United States the American Philosophical Society, originated by Benjamin Franklin, was founded in 1743 and was followed by the AMERICAN ACADEMY OF ARTS AND SCIENCES in 1780. The Philadelphia Academy of Natural Science was established in 1812.

National and International Organizations. Out of these origins the number of learned societies, academies and similar organizations multiplied rapidly with the expansion of knowledge, the spread of cultural interests, the increase of specialization, and the development of methods of research. There is scarcely any type of intellectual interest which is not represented by its learned society. The organizations afford opportunities for conferences and discussions, promote research, record discoveries in their journals and proceedings, encourage research through various forms of aid and awards, and reward distinguished service. For the promotion of joint interests several national associations for the advancement of science have sprung up; among these are the *Gesellschaft deutscher Naturforscher und Aerzte* in Germany, 1822; the British Association for the Advancement of Science, 1831; the AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, 1847; and the *Association française pour l'Avancement des Sciences,* 1872.

In the United States the American Council of Learned Societies was organized in 1920 and incorporated in 1924 to advance the general interests of the humanistic studies and especially to maintain and strengthen relations among the national societies devoted to such studies. Since science and learning recognize no national boundaries, there have developed out of sporadic international congresses a large number of international learned societies which meet at different times in different parts of the world. Finally, the interests of international scholarship have been entrusted by the League of Nations to the Committee on Intellectual Co-operation. I. L. K.

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LEASE, a contract for the possession and use of real estate and the benefits thereof. The lease is made for life or for a term of years, shorter always than the period owned or controlled by the lessor. The period of the lease is called a "term," because the time is limited. Almost anything can be leased, although if it were not realty, forests or fixtures, the word lease might not appear. The statute of Frauds requires leases for more than a year to be in writing. Leasehold is the estate held by virtue of the lease.

LEAST SQUARES, a term used in connection with PROBABIEITY AND ERROR.

LEATHER, any animal skin that has been tanned (*see* TANNING) and modified in other ways to make it of greater usefulness to mankind. Before tanning, undesirable components of the skin are removed, such as epidermis, hair, scales, glands, soluble proteins, blood and salts. At the same time, the protein fibers are permitted to absorb water, regaining their normal sizes and shapes. Fibers which have become glued together are separated by mechanical action and by the absorption of water. The skin, freed from the undesirable constituents, consists chiefly of white connective tissue made up of the protein, or class of proteins, known as COLLAGEN. It is then ready to be tanned.

Tanning is effected by bringing the skin into contact with a solution of the desired tanning agent, with or without mechanical agitation, and leaving it until the desired degree of tannage has been obtained. The later operations are numerous and varied according to the properties desired in the finished leather. Light leathers are usually dyed and fat-liquored with emulsions of oils in order to lubricate the fibers and make the leather soft. They are generally coated on the grain surface with a mixing material and rolled, brushed or glazed in order to bring out a luster. Sole leather is rolled under very heavy pressure in order to make it firm. Patent leathers are coated with varnish to give them their characteristic shine. Waterproof leathers are impregnated with waxes and other water resisting materials.

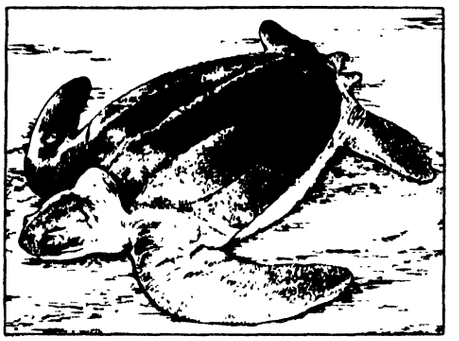
Among the important, controllable properties of leather are tensile strength, stretch, flexibility, ventilating power, resilience, porosity, wear resistance, water resistance, dimensional changes with relative humidity, density, heat resistance. J. A. W.

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LEATHER, ARTIFICIAL, a substance resembling real leather, that is made from cotton or similar goods as a base which is then treated and impregnated with a preparation of cellulose nitrate or similar substance to make the base waterproof. In the older methods originated in the latter half of the nineteenth century, ordinary cotton cloth was coated with linseed, cotton seed, rape seed or similar oil, to which had been previously added a pigment and a filler (silicate or baryte). Recent methods of manufacture start with PYROXYLIN (a nitrocellulose, containing 11 to 12% nitrogen, just insufficient to be classed as an explosive) as a base. This is dissolved in an alcohol, hydrocarbon or any other appropriate organic liquid, to which is then added a solution of pigments, usually in a mixture of drying oils or of so-called plasticizers, which must lend some firmness to the material without making it brittle.

After the waterproof coating has been applied by pressing or rolling, the resulting fabric is heated to evaporate the various solvents, which in the case of the older methods may require several hours. On account of this subsequent heating, organic dyes are of little use, and only mineral pigments can be considered. Sometimes rubber solutions are employed to effect the waterproofing, or even glycerine or gelatine, first made insoluble by chemical processes; somewhat similar products are manufactured under the name of LINOLEUM (or FLOORCLOTH). The final product is often pressed or stamped to give it the grainy appearance of real leather. Because of its lower cost and in some instances greater durability than real leather, artificial leather finds wide applications, notably in the automobile industry, for weatherproof tops, curtains and seat-covers. It is further used for bookbinding, as a cover material for writing desks, in luggage, and generally to take the place of real leather wherever possible. W. J. L.

LEATHERBACK (*Dermochelys coriacea*), the largest living turtle, called also trunkback or luth, found widely in Atlantic waters. It is distinguished



LEATHERBACK OR SEA TURTLE

from other turtles by the possession of seven longitudinal ridges on the carapace, which is incased in a soft, leather-like, oily integument. The leatherback sometimes attains a length of 8 ft. and a weight of 800 lbs. Its ill-flavored flesh is seldom used for food.

LEATHER BELTS. *See* BELTING.

LEATHERLEAF (*Chamædaphne calyculata*), a low, much branched evergreen shrub of the heath family widely distributed in bogs and swamps in north temperate regions. In North America it occurs from Newfoundland to Alaska and southward to Georgia and British Columbia. The shrub grows 2 to 4 ft. high bearing thick, flat, leathery leaves, covered with scurfy scales, and small cylindrical white flowers in one-sided leafy racemes, appearing in early spring.

LEATHERSTOCKING, the hero of five novels by JAMES FENIMORE COOPER. Known as Natty

Bumppo, as Hawkeye and as Long Rifle, he was honest, utterly fearless, and knew as much woodlore as the Indians themselves.

LEATHERWOOD (*Dirca palustris*), a much branched shrub of the mezereum family, called also moosewood and wicopy. It is found in damp woods from New Brunswick to Ontario and southward. The plant grows 2 to 6 ft. high with jointed branchlets bearing entire leaves, small, light-yellow flowers, opening before the leaves, and an oblong, reddish, poisonous stone fruit (drupe). Leatherwood is so named because of its exceedingly tough inner bark, formerly used by the Indians for thongs. The western leatherwood (*D. occidentalis*), with a similar inner bark, occurs in California.



EASTERN LEATHERWOOD
(Dirca palustris). Branch with leaves and fruit, flowering branchlet and single flower (enlarged)

LEATHERWOOD, SOUTHERN (*Cyrilla racemiflora*), a spongy-barked, hard-wooded shrub or small tree of the cyrilla family called also ironwood and titi. The shrub grows on the edges of swamps and streams from southern Virginia to Florida and Texas and also in the West Indies and South America. It bears shining veiny leaves and small white flowers in dense narrow clusters.

LEAVENWORTH, a city in northeastern Kansas, situated on the Missouri River, 30 mi. northwest of Kansas City. It is the county seat of Leavenworth Co. and a market and shipping center served by six railroads, bus and truck lines, and an interurban railway. Much grain is raised in this region. There are many factories producing gloves, overalls, flour, lumber products, furniture and a large quantity of machinery and iron products. In 1929 the manufactures reached about $8,000,000; the retail trade amounted to $11,262,232. Coal is found within and around the city.

Fort Leavenworth, built in 1827, an army post and government reservation with an army staff college, an aviation field, and the Federal prison and the U.S. Disciplinary Barracks, is 3 mi. distant. There is also a citizens military training camp. Nearby are the National Home for Disabled Volunteer Soldiers, the state penitentiary, and the state industrial farm for women. Leavenworth was incorporated in 1854. Pop. 1920, 16,912; 1930, 17,466.

LEBANON, a state of Syria, consisting of a long coastal strip extending from north of Tripoli to Palestine, and from the Mediterranean to the crest of Anti-Lebanon. The area is estimated at about 4,300 sq. mi.; population in 1929, 862,618. It was largely as a result of the religious differences among the Moslem sects that the French organized Syria into four territories. Lebanon became a republic in 1920.

Much of the region is under cultivation. The products include wheat, silk, tobacco. The cultivation of cotton has been considerably extended in recent years. Wine is produced in large quantities. Coal and iron are mined. Beirut is the capital and chief port.

LEBANON, a city in northwestern central Indiana, the county seat of Boone Co., situated 26 mi. northwest of Indianapolis, in a corn-growing and dairying region. Bus lines and three railroads serve the city. Lebanon manufactures condensed milk, kitchen cabinets and oil purifiers. The city was founded in 1831 and incorporated in 1875. Pop. 1920, 6,257; 1930, 6,445.

LEBANON, a city in central Kentucky, the county seat of Marion Co. It is situated near Rolling Fork River, 60 mi. southwest of Louisville and is served by bus lines and the Louisville and Nashville Railroad. Lebanon is a trade center for a tobacco- and grain-growing region and is a shipping point for hardwood and poultry. It is on the edge of the Blue Grass Region. During the Civil War the city was captured and recaptured several times and finally burned by the Confederates on their evacuation. A National Cemetery is located here. Lebanon was founded in 1813. Pop. 1920, 3,239; 1930, 3,248.

LEBANON, a town of western New Hampshire, in Grafton Co., on the Connecticut River at the mouth of the Mascoma, about 65 mi. northwest of Concord. The Boston and Maine Railroad and bus lines afford transportation. Dairy and truck farms are in the vicinity. Products include underwear, electrical and woolen goods, lumber and brick. Dairy and truck farms are operated in the vicinity. Lebanon was incorporated in 1761. Pop. 1920, 6,162; 1930, 7,093.

LEBANON, a city of Lebanon Co., southeastern Pennsylvania; it is located on William Penn Highway, about 85 mi. west of Philadelphia and served by the Pennsylvania and the Reading railways and motor bus lines. It is a county seat and the trading center of a large population in the fertile Lebanon Valley district. Wheat, corn and oats are produced and valued at about $3,000,000 annually. In 1929 its manufactures, chiefly iron and steel, textiles, clothing, shoes, chemicals and furniture, were valued approximately at $34,000,000; the retail trade amounted to $12,059,128. About 5 mi. south are the Cornwall iron mines, one of the most productive magnetite deposits in the world. Limestone, brownstone and brick clay are also found in the vicinity.

Lebanon was founded in 1750 by George Steitz and became a city in 1885. One of America's oldest iron mines has been in continual production at Cornwall since 1740. One of the oldest tunnels in the

country, built in 1834, is still in prime condition. Lebanon is under the commission form of government. Pop. 1920, 24,643; 1930, 25,561; about 5% foreign-born.

LEBANON, a town in northern Tennessee, the county seat of Wilson Co. It is situated 31 mi. northeast of Nashville and is served by bus lines and two railroads. Lebanon has two airports. Dairying and sheep-raising are carried on in the vicinity. Lebanon is a shipping center, manufactures woolen goods and lead pencils, and is the seat of Cumberland University, founded in 1842, and Castle Heights Military Academy. Lebanon was settled in 1799 and incorporated in 1802. At one time Sam Houston practiced law here. Pop. 1920, 4,084; 1930, 4,656.

LEBEDEV, PETR NIKOLAJEVICH (1866-1912), Russian physicist, was born at Moscow, Mar. 10, 1866. In 1892 he became professor of physics at the University of Moscow. In 1899 he substantiated the light pressure required by J. C. Maxwell's equations and in 1910 succeeded in measuring the pressure. He died at Moscow, Mar. 1, 1912.

LEBLANC, NICOLAS (1742-1806), French inventor, was born at Issoudun, Indre, Dec. 6, 1742. In 1791 he discovered the method of making soda from salt, a matter of invaluable commercial importance. In 1791 he built a factory, but it was seized, as was his patent, later by the Revolutionary Government. Leblanc committed suicide in a poorhouse at St. Denis, Jan. 16, 1806.

LEBRUN, ALBERT F. (1871-), President of France, was born near Mercy-le-Haut, Lorraine, on Aug. 29, 1871. He became a mining engineer and published several books on the salt mines of eastern France. After 1898 he entered local politics in the department of Meurthe-et-Moselle, and was president of the local council for over 26 years. He was a member of the Chamber of Deputies from 1900 to 1920 and then was elected to the Senate. During his political career Lebrun was twice Minister of Colonies and, in the World War, Minister of Blockade, besides being a member of many commissions. Following the assassination of President PAUL DOUMER, he was elected on May 10, 1932, President of the French Republic.

LE BRUN, CHARLES (1619-90), French court painter, was born at Paris, Feb. 24, 1619. With Jean Baptiste Colbert, the statesman, he founded the Academy of Painting and Sculpture, the French Academy at Rome and the Gobelin tapestry works. For Louis XIV, from whom he received a yearly pension of 12,000 livres, he decorated the Halls of War and Peace, the Great Hall and the Ambassadors' Staircase at Versailles and the Gallery of Apollo at the Louvre. Le Brun was the ideal court painter, pompous and dull, but a fine draughtsman in the grand style and a powerful decorator. He died at Paris, Feb. 22, 1690.

LEBRUN, MADAME. *See* VIGÉE-LEBRUN.

LECCE, a city of southeastern Italy near the Adriatic Sea, capital of the province of the same name, and the seat of a bishopric. The cathedral was built in 1230 and restored in the 17th century. Among notable buildings are the church of SS. Nicola and Cataldo, built 1180, that of Santa Croce, built in 1353, the remains of a Roman amphitheater, a library, museum and two theaters. There are various industries and trade is carried on in olive oil and wine. Lecce probably occupies the site of the ancient *Lupiae.* In Norman times it was called Lycia. Pop. with suburbs, 1931, 46,782.

LE CID. *See* CID, LE.

LECKY, WLLIAM EDWARD HARTPOLE (1838-1903), Irish historian and essayist, was born at Newton Park, Ireland, on Mar. 26, 1838. He graduated from Trinity College, Dublin, in 1859. His first works, *Religious Tendencies of the Age,* 1860, and *Leaders of Public Opinion in Ireland,* 1861, were unsuccessful. However, his *Declining Sense of the Miraculous,* 1863, met with great success, as did also his *Rise and Influence of Rationalism in Europe,* 1865. His reputation was augmented by the publication of a *History of European Morals,* 1869. *The History of England in the 18th Century,* 1878-90, was his most famous work, and was acclaimed with the appearance of each separate volume. In 1895-1903 he represented Dublin University in the House of Commons, where he championed reform in Ireland, but opposed Home Rule. He was made a privy councillor in 1897 and a member of the British Academy in 1901. He also received the Order of Merit. He died in London on Oct. 22, 1903.

LE CLANCHE CELL. *See* CELL, VOLTAIC.

LECONTE DE LISLE, CHARLES MARIE RENÉ (1818-94), French poet, was born on the Island of Reunion, Oct. 22, 1818. His first volume of poetry was published in 1852, under the title of *Poèmes Antiques.* In the preface he outlined his doctrines of poetry. These were destined to form the starting point of the Parnassian movement, an extremely important literary school of which Leconte de Lisle was accorded the leadership. He was elected to the French Academy in 1886. He died near Louveciennes, July 18, 1894.

LE CORBUSIER (1887-), the name adopted by Charles-Edouard Jeanneret-Gris, Swiss architect, who was born at La-Chaux-de-Fonds, near Neuchatel, in 1887. He interested himself early in concrete construction, and turned to his chosen profession about 1920. He was soon recognized as a pioneer in a new domestic architecture, his theory being that modern architecture should express the spirit of the machine age, and should utilize the new materials and standardized methods of the age. The outstanding features of his concrete houses are the rectangular plan, unadorned exterior surfaces, the use of structural columns to lift them above the ground, continuous horizontal rows of windows, and flat roofs adapted for gardens. Examples are the housing development at Pessac near Bordeaux, apartment houses at Passy, the Salvation Army citadel in Paris, and exhibition houses at Stuttgart. Le Corbusier and his associate, his cousin Pierre Jeanneret, the engineer, designed the Moscow

Headquarters of the Soviet Cooperatives, and won a first prize in a competition of plans for the Palace of Nations at Geneva, 1927.

LE CREUSOT, a city in central France, department of Saône-et-Loire, headquarters of the famous Schneider machine-shops and one of the greatest metallurgical centers in Europe. The works, founded in 1836, comprise coal mines, furnaces and steel mills. There are shops for the manufacture of locomotives, machinery, and heavy munitions. Pop. 1931, 32,034.

LECTERN, a desk, portable or stationary, from which the Scripture lessons, and sometimes the Gospels, are read.

LECTION, in the ancient Church the reading of a portion of the Scripture or of the history of the saints and martyrs at services, as well as in the monasteries, by the lector, a cleric appointed for the purpose. After the deacons and presbyters undertook the duty, the office of lector was merely nominal. The custom still prevails in monasteries, however, where it is usual to read to the monks in the refectory while they eat their meals. From the custom of adding reproofs and warnings to the passage read is derived the expression, to give someone "a lecture." The lectionary is the schedule of the sections of the Scripture to be read on Sundays and feast days. The word lectionaries is also used in a narrower sense to designate the lessons from the Acts of the Apostles and the Epistles in contrast to those from the Gospels.

LECTURE, in its original meaning a "reading" delivered for instruction, has of recent times frequently acquired characteristics somewhat far removed from those that marked the early form of this method of conveying information and knowledge. Although formal discourses of an academic nature are still a part of university education, the modern lecture, more especially in the United States, has become so popular even in non-academic circles that it is frequently regarded as a form of cultural entertainment which men and women are willing to pay to hear, much as they will pay to hear a famous violinist, a play of Shakespeare, or a symphony concert. These non-academic lecturers are chiefly recruited from among celebrities, particularly those engaged in literary work, and the subjects of their lectures are naturally concerned with some aspect of the field of activity with which they are identified.

LECTURER, one who discourses in public or before private gatherings, either for their instruction or diversion. A lecturer is primarily an ARTIST, but he must be thoroughly informed in his subject. In greatest current demand are those lecturers who can present effectively some new or significant phase of a current situation or event or a contemporary personality. A pleasing and adequate voice, an attractive literary style and an engrossing personality are valuable assets in public lecturing. A unique experience, such as having been the EXPLORER of a remote and interesting place, the possessor of authoritative knowledge of a scientific, political or artistic subject, or a prominent figure in the literary world, is an almost necessary preliminary to wide success as a lecturer.

LEDA, in Greek mythology, daughter of Thestius and Eurythemis, and wife of Tyndareus, King of Sparta. She was carried off by Zeus in the form of a swan. Leda was mother of CASTOR AND POLLUX, also of Helen and Clytemnestra, although one legend says Helen was only a foster child.

LEE, ARTHUR (1740-92), American diplomat, was born in Stratford, Va., on Dec. 20, 1740. He was educated in England, and practiced law and medicine there and in Virginia. During the Revolutionary War, as an American commissioner in Europe, he attempted negotiations with France, Spain and Germany, and in 1778, with Franklin and Deane, signed treaties with France. He was a member of the Confederation Congress in 1782-85, and of the treasury board in 1784-89. He died at Urbana, Va., Dec. 12, 1792.

LEE, ARTHUR (1881-), American sculptor, was born in Trondheim, Norway, May 4, 1881. He studied in Paris, London and Italy, and settled in New York. Lee was awarded the George D. Widener memorial gold medal in 1924 at the Pennsylvania Academy of Fine Arts. His works include *Eureka,* Cooper Union, New York; and *Volupte,* Metropolitan Museum.

LEE, CHARLES (1731-82), an American soldier, was born at Dernhall, England, in 1731. With a lieutenancy in the British army, he was a member of Braddock's ill-fated command in 1755. In the forces of Portugal in 1762 he distinguished himself, and was made a lieutenant-colonel under JOHN BURGOYNE. In 1773 he went to America, and there took part in the general protest against Great Britain. In 1775 he became second in command to Washington, and the following year was made chief of the Southern Department. He was captured in 1777 near Morristown, and while in the hands of the British traitorously revealed the American military plans. Nevertheless, he was exchanged in 1778, only to bring down upon himself charges of treachery in his conduct of the battle of MONMOUTH. After trial by a court-martial, he was relieved of his command and dismissed from the service. He returned to farming on his estate in Berkeley Co., Va. He died at Philadelphia in 1782.

LEE, HENRY (1756-1818), American soldier and governor of Virginia, was born near Dumfries, Va., Jan. 29, 1756. He was graduated in 1773 at Princeton University. During the Revolution he was commander of light troops and for his signal services with these was dubbed "Light Horse Harry." He won great distinction covering Greene's retreat in the South, and in the battles of Guilford Courthouse, Camden and Eutaw Springs. In 1798 he was commissioned major-general. Lee was a member of the Constitutional Convention of 1787 and voted for the adoption of the Federal Constitution at the Virginia state convention in 1788. He served in the Virginia

general assembly in 1789-91; was governor of Virginia in 1791-94; and in 1799-1801 sat in Congress. At Washington's death he paid the tribute, "First in war, first in peace and first in the hearts of his countrymen." Lee died at Cumberland Island, Mar. 25, 1818.

LEE, RICHARD HENRY (1732-94), American soldier and statesman, was born at Stratford, Va., on Jan. 20, 1732. He was educated in England, appointed justice of the peace for Westmoreland Co., 1757, and in 1761 was elected to the Virginia House of Burgesses, where he advocated taxing the "iniquitous and disgraceful" slave trade out of existence. He opposed the Stamp Act, was active in the COMMITTEE OF CORRESPONDENCE, and was a delegate to the First and Second Continental Congresses, 1774-80. On June 7, 1776, he made the motion for a Declaration of Independence, which was seconded by John Adams. He was again a member of the Virginia assembly 1780-82, and president of the Confederation in 1784. He opposed the Constitution of 1787 because he thought it infringed on the independence of the states. He was elected to the Senate as an anti-Federalist, but later supported Washington's administration, and was the author of the Tenth Amendment. He died at Chantilly, Va., on Jan. 19, 1794.

LEE, ROBERT EDWARD (1807-70), Confederate general, was born Jan. 19, 1807 at the Lee ancestral home, Stratford, Westmoreland Co., Va., built by the able Governor Thomas Lee with the aid of his King and Queen. Robert Edward Lee was the fourth son of Gen. Henry "Light Horse Harry" Lee, also called "Lee of the Legion," and his second wife, Anne Hill Carter, great-granddaughter of Governor Spotswood and through him descended from Robert Bruce, King of Scotland. She was a daughter of Charles Carter of "Shirley" on the James River and great-granddaughter of Robert "King" Carter, one of the greatest land-owners of Colonial Virginia.

Robert received his preliminary education from his mother and in the private schools of Alexandria. He graduated from West Point in 1829 and was commissioned Second Lieutenant of Engineers. In 1831 he married Mary Anne Randolph Custis, great-granddaughter of Martha Washington and heiress to the estates of "Arlington" on the Potomac and "White House" on the Pamunkey. They had seven children, Gen. George Washington Custis, Mary Custis, Gen. William Henry Fitzhugh, Capt. Robert Edward, Annie, Agnes and Mildred.

The young Engineer Lieutenant spent the years from 1829 to 1834 in work on the defenses of Hampton Roads, the three succeeding years in Washington as Assistant to the Chief Engineer of the Army. Made First Lieutenant in 1836, he was, in the summer of 1837, specially selected by Gen. Scott as the one man best fitted to take charge of improving the Mississippi River at St. Louis. In 1838 he became Captain of Engineers. He was put in charge of the military defenses of New York harbor in 1841 and remained at Ft. Hamilton until sent to the Mexican War in 1846. Serving on Gen. Scott's staff, Lee repeatedly won the highest praise for his skill, resourcefulness and bravery, and laid the foundation of his great reputation, receiving three brevet promotions in the field.

In 1849 he was sent with other engineers to recommend new coast defenses in Florida. Then he was busy for three years constructing Ft. Carroll just below Baltimore, meanwhile declining the offer of the Cuban Junta to command their forces. In 1852-55 as Superintendent of West Point, he was notable for his interest in each student, and he reluctantly gave up this work and his engineering to accept promotion to a new Cavalry regiment as Lieutenant-colonel. Helping organize and discipline this regiment and serving with it in the Indian country of the southwest during 1856-57, and taking command of it when Col. Albert Sidney Johnson was ordered to Washington, Lee returned to Arlington in the Fall of 1857 to act as executor of his father-in-law's estate. Occupied with this, he was on leave from active duty until the summer of 1859, when he returned to Texas but only to go back immediately to Arlington where he shortly commanded the detachment which captured John Brown and his raiders in Oct., 1859. After another year in Texas protecting the border against Mexican bandits, he was summoned to Washington in Feb., 1861, where he was promoted to Colonel of the First Cavalry and saw Lincoln inaugurated.

Virginia seceded from the Union on Apr. 17, 1861, rather than fight the previously seceded States. The next day, at the suggestion of Gen. Scott, Col. Lee was offered the command of the Federal forces in the field. On Apr. 20th he declined and resigned his commission in the United States Army. Two days later he left Arlington where he was never to live again, and, in answer to a summons from the Governor of Virginia, went to Richmond to accept in modest words of self-depreciation and patriotic devotion the position of Major General and Commander-in-Chief of the Virginia forces, nominated by the Governor and unanimously elected by the Convention. Made a Brigadier-General in the Confederate Army after Virginia had joined the Confederacy, Lee organized from the volunteers pouring into Richmond 60 regiments of infantry and cavalry and many batteries of artillery, which he sent to the front within two months and became in June, 1861, Military Adviser to President Davis. Promoted to Major General and sent to command in West Virginia, he was unable to win success there with the handicaps of hostile population and untrained officers and troops.

President Davis then sent him to command the coast defences in South Carolina, Georgia, and Florida, where he constructed such a strong line of interior defences that the coast was thoroughly protected. He was ordered back to Richmond in Mar., 1862, as Military Adviser to the President, and caused Gen. Joseph E. Johnston to oppose McClellan in the Yorktown Peninsula instead of closer to Richmond

while Stonewall Jackson was sent on his Valley Campaign. Taking over the command in the field from the severely wounded Johnston, Lee outgeneralled and outfought McClellan in the Seven Days battles south of Richmond, drove him back and caused his recall. Lee then turned northwest, defeated Pope's army and drove it back to Washington, and entered Maryland to invade the North. Checked by McClellan at the drawn battle of Antietam or Sharpsburg, Lee retired to a strong position on the Rappahannock and repulsed Burnside with great slaughter at Fredericksburg in Dec., 1862. In April, 1863 Hooker tried to turn the Confederate left but was himself flanked and defeated at Chancellorsville. Here, however, Lee lost his greatest lieutenant, Stonewall Jackson, and felt this irreparable loss in every campaign thereafter. In June, 1863, he invaded Pennsylvania by the Shenandoah Valley but was defeated at Gettysburg July 2-3, and skilfully withdrew to Virginia to winter in a strong position along the Rapidan. In May, 1864, Grant, beginning his series of efforts to turn the Confederate right flank, was repulsed with heavy loss in the Wilderness, at Spottsylvania and at Cold Harbor, then crossed the James and took up the siege of Petersburg, having used 180,000 men, taken a month and lost 55,000 men to force Lee's 80,000 the 70 miles from the Rappahannock. The siege dragged through the summer, winter and spring until Lee left his lines on Apr. 2, 1865, to try to join Johnston's army to the south. Grant forced him to surrender at Appomattox, Apr. 9th. On Jan. 31 Lee had been made Commander-in-chief. On Apr. 10 he issued to his army a simple farewell address and then rode to Richmond. An indictment for treason was dropped through the influence of Grant, and President Johnson pardoned all the previously unpardoned Confederates on Dec. 25, 1868.

Accepting late in the summer of 1865 the Presidency of Washington College, Virginia, with a salary of $1,500, Lee steadfastly declined during the rest of his life the many offers made to him, of houses, estates, money and positions. He lived at Lexington during the rest of his life, and was honored and mourned by the whole Nation when he died on Oct. 12, 1870. Gen. Maurice has written, "Lee's great contribution to the art of war was his understanding of the part field defences could play in aiding manoeuvre. In this he was years ahead of his time, and it was not until the beginning of the 20th century that his methods were really understood and applied by the military world." E. J. W.

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LEE, SIR SIDNEY (1859-1926), English biographer and scholar whose real name was Solomon Lazarus Levi, was born in London, Dec. 5, 1859. He graduated at Oxford in 1882, and the next year became assistant editor of the *Dictionary of National Biography.* In 1891 he became editor in chief. For this publication he himself wrote over 800 sketches. He published independently *Life of William Shakespeare, Life of Queen Victoria, Life of Edward VII* and numerous other works. In 1913-24 he was Professor of English Literature at East London College. Lee died in London, Mar. 3, 1926.

LEE, a town and village in Berkshire Co., in the beautiful Berkshire hills, western Massachusetts. The village is situated about 10 mi. south of Pittsfield and is served by the New Haven Railroad. There are a number of factories producing chiefly paper. The paper industry began here in 1806, and at one time Lee was the largest paper making center in the United States. The manufacture of paper from pulp was first undertaken in Lee in 1867. The town was incorporated in 1777. In Lee during Shay's rebellion, 1786, Shay's men dispersed a body of Massachusetts State troops with a counterfeit cannon. Pop. 1920, 4,085; 1930, 4,061.

LEECH, the common name for members of a class (*Hirudinea*) of annelid worms, which are carnivorous, or external parasites on other animals, whose blood they suck. Most leeches will attack, indifferently, fish, man or any other vertebrate, but a few are restricted to a particular type of host. The majority are found in fresh water; some, however, occur in the sea and some live on the ground in damp places. They are most numerous in the tropics, and occur also in temperate regions where it is not too cold.

The most interesting of the leeches is the fresh water medicinal leech (*Hirudo medicinalis*), an Old World species which has been introduced into some American waters. It is a yellowish-brown creature, less than an inch long, with three saw-like teeth in its mouth, that make neat, sharp cuts. Medicinal leeches were formerly among the chief items of a doctor's equipment, since blood-letting, for which they were employed, was a common remedy. They are still used by native doctors in India. Leeches are now important mainly because their salivary glands secrete hirudin, a substance which keeps blood from clotting. In some tropical localities certain species are serious pests.

LEE-CHEE, the fruit of a Chinese tree of the soapberry family widely cultivated in the tropics, more properly called LITCHI.

LEEDS, a city in the West Riding of Yorkshire, England, 185 mi. northwest from London. It is on the River Aire which here becomes navigable and is crossed by eight bridges. Among the noteworthy public buildings are the town hall, considered one of the finest municipal edifices in the kingdom, the royal exchange, the public library, and the infirmary, a handsome Gothic building. The University of Leeds has about 1,500 students. There are several large parks in the neighborhood, one containing the ruins of Kirkstall Abbey. Although Leeds is the largest city in the woolen district of Yorkshire, it is not now a principal center of wool manufacture, which occupies only fourth place among the indus-

tries of the city. A fifth of the insured workers are employed in clothing factories, and a smaller fraction are found in general engineering plants which manufacture chiefly locomotives, transport material and factory equipment. Next come the building trades, the woolen industry and printing, each with less than half the numbers of those in the first group. Leeds was mentioned by the Venerable Bede as being the capital of a small British kingdom about 616. Pop. 1921, 463,122; 1931, 482,789.

LEEK (*Allium Porrum*), a tall, very hardy biennial of the lily family, closely allied to the onion, originated through cultivation. It is extensively planted in Europe where it has been grown since Greek and Roman times. In Wales, where it is highly esteemed, it is the national symbol. The small simple bulb gives rise to narrow iris-like leaves, 2 to 3 ft. long, and a pithy stalk, 2 or 3 ft. high, ending in a dense cluster of pinkish flowers. The blanched stem and leaves, in taste somewhat milder than the onion, are eaten raw, boiled, and in soups and stews; the leaves are used for flavoring. In the United States the leek is little grown except for use by the foreign population in large cities.

LEE RIVER, a stream in the county of Cork, Irish Free State, rising in Lake Gouganebarra, not far from Bantry Bay. It flows eastward over a course of 50 mi. through old, red-sandstone moors and enters the Atlantic Ocean through Cork Harbor. The lower course is "drowned" in an estuary, at the head of which the city of Cork is located. Queenstown is situated near the river's mouth. This stream is famous for its rod salmon-fishing.

LEEUWARDEN, capital of the Dutch province of Friesland, located on the canal connecting Groningen and Harlingen and transected by small canals. Among the churches, the most interesting perhaps is St. James, with the monuments of the governors of Friesland. The most noteworthy public buildings are the old castle of the governors of the House of Nassau-Diez, the government building, the new court house and the 16th century Gothic chancellery of the former court of Friesland. The Oldehove is a large and imposing city hall with the municipal library, valuable archives and paintings. It is the seat of many learned and charitable societies. The chief manufactures are gold and silver ware, mirrors, pianos and organs. Leeuwarden has the largest fruit and cattle market in the Netherlands. There is also a large trade in chicory, flax, hides, bones, woolen goods and groceries, and in wine and brandy. In the 13th century Leeuwarden was located on a large gulf but since has become an inland city due to the accumulation of silt on the embankments. Pop. 1930,

LEEUWENHOEK, or **LEUWENHOEK, ANTONJ VAN** (1632-1723), Dutch microscopist, born at Delft on October 24, 1632, was a draper and city hall janitor, who devoted his leisure to the study of natural history. He soon became interested in the manufacture of microscopes and in the study of the minute structure of various materials. Leeuwenhoek sent as many as 375 scientific papers to the Royal Society and 27 to the French Academy of Sciences. He has been credited with first describing spermatozoa in dogs and other animals and was the first to see them under the microscope; gave the first accurate description of the red blood corpuscles; discovered the striped character of voluntary muscle, the elastic covering of the voluntary muscles and the structure of the crystalline lens, and found microörganisms in the teeth. He added to Malpighi's discovery and Leeuwenhoek's comprehensive work on the capillary circulation which finally completed Harvey's demonstration. He died in Delft on August 26, 1723. M. F.

LEEWARD ISLANDS, an island group in the West Indies extending from Porto Rico to Martinique and including Martinique, Dominica, Guadeloupe, Montserrat, Antigua, St. Christopher, or St. Kitts, Nevis and the Virgin Islands. Great Britain, the United States, France and Holland own various of these islands and their dependencies. The British group known as the LEEWARD ISLANDS is divided into five presidencies, Antigua, St. Christopher, Anguilla Dominica, Montserrat and the Virgin Islands. This colony has a total area of 715 sq. mi. Estimated combined pop. 1930, 126,500.

LEFAVOUR, HENRY (1862-), American educator, was born at Salem, Mass., Sept. 4, 1862. He was graduated from Williams College, 1883 and 1886, and studied at the University of Berlin. He taught at Williston Seminary, 1883-84, and from 1884 to 1902, served on the faculty of Williams College as instructor, professor of physics, and as dean. He became president of Simmons College in 1902, and resigned in 1932.

LEFT PARTIES. In England since the early years of the 18th century the majority and minority parties have sat facing each other across the aisle of the House of Commons, the Government to the right of the Speaker, the Opposition to his left. On the Continent where parties are numerous the seats are arranged in concentric rows facing the president's chair; and the party groups occupy sectors to the left or right or near the center according to their degree of radicalism or conservatism. In the French Chamber of Deputies the Left now includes Communists, Socialists, Republican-Socialists and Radical-Socialists; in the German Reichstag, Communists and Social Democrats. E. M. S.

LEG, word generally applied to the extremity of the body, or part below the groin. As an anatomical term, however, the leg is that region between the knee and the ankle, the part above the knee being the thigh.

Concerning the anatomy of the leg, *see* ARTERIAL SYSTEM; LYMPHATIC SYSTEM; MUSCULAR SYSTEM; NERVOUS SYSTEM; SKELETON; VEIN.

LEGACY, a gift of PERSONAL PROPERTY by WILL. Legacies are described according to their character or the conditions surrounding them. When payable out of a mentioned source, it is called "demonstrative."

If the legatee has a choice of more than one thing, it is "alternative." Should the testator mention a part of his estate, distinguishing it from other parts, it is called "specific." In case the legatee dies before the testator, it is a "lapsed" legacy. Given without condition, a legacy is "absolute." The most important legacy is called "residuary," meaning that, after all other legacies are paid, a particular legatee gets what remains of the estate.

LEGACY DUTY and **SUCCESSION DUTY,** *see* INHERITANCE TAX.

LEGAL AID, a part of the general movement for improving the administration of justice in the United States. Although there are constitutional guarantees that before the law all men must be equal, many persons, on account of their poverty, are in danger of being denied justice. The obstacles for a poor man are court costs, delay of court procedure and the expense of counsel. Legal aid work is machinery for helping the poor man over these obstacles. The Legal Aid Society is a poor man's law office. It sends out no bills.

While all lawyers do some of this work in its organized form, it began with the New York Legal Aid Society, established in 1876. Today it has spread to all the large cities of the country, there being some 80 organizations, handling about 175,000 cases annually. Part of their work is the collection of wages and other small sums of money. In this field they report recoveries of over $800,000 a year in amounts averaging less than $20 a case. Their expenses total $500,000. They handle almost every conceivable type of case so long as the client cannot pay a fee.

The work has the support of the bar associations, including the American Bar Association. The leaders of the bar have spoken in its favor. The late Chief Justice W. H. Taft and Chief Justice C. E. Hughes have been honorary presidents of the National Association of Legal Aid Organizations. It contacts the field of social work, of the law school, of the governmental agencies, and other groups engaged in improving the administration of justice. J. S. B.

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LEGAL EDUCATION. The preparation for the practice of law may be secured in three ways. Applicants for the bar may gain their legal education entirely in a law office, partly in a law office and partly in a law school, or entirely in a law school. In the 18th century, in America as elsewhere, all technical legal study was done in lawyers' offices. This resulted in a wide diversity of training and equipment of lawyers which made standards at the bar difficult to maintain.

Blackstone's lectures, delivered at Oxford in 1753, and the publication of his *Commentaries on the Laws of England,* in 1765, were the first important contributions to the academic study of law. This book, which became as popular in America as in England, was the favorite text-book of the American law student. In America an important step forward was made with the establishment in 1784 of Judge Tapping Reeve's school for the teaching of common law, in Litchfield, Conn. During its brilliant career of 35 years, this school educated more than 1,000 candidates for the bar, many of whom became famous in political and professional life. The decline of the Litchfield school led to the rapid rise of the Harvard Law School, founded in 1817, the oldest of the existing law schools.

The Yale Law School, established in 1824, was followed by law schools at the University of Pennsylvania, the University of Michigan, Northwestern University (then Union College of Chicago) and Columbia University. Law schools without university connections were opened in Cincinnati in 1833, in Louisville, Ky., in 1846, and at Lebanon, Tenn., in 1847. Before the middle of the 19th century, students were admitted to law schools usually without any examination or any requirements as to courses of study. By the end of the century, Harvard University required a college degree for admission to the Law School of the university, and Northwestern, University of Pittsburgh and Leland Stanford universities have since followed suit. Other law schools have lengthened their courses and raised their requirements appreciably.

In 1928-29, there were 78 law schools in the United States offering full-time work and 95 offering part-time work. Among the full-time schools, 14 required three or more years in college, followed by three years in law school; 61 required two years in college, followed by a minimum of three years in law school; and three required from one to three academic years.

While legal training may still be secured entirely by study in a law office in certain parts of the country, this system of training has given way largely to part- or full-time law school training. Many of the states demand certain preliminary education for candidates for the bar, and others have definite requirements where law school and office work are combined. While admission to the bar in general carries with it a professional examination, there are some states where the graduates of certain law schools are exempted from such professional examination. The American Bar Association has condemned this diploma privilege, taking the stand that every candidate for the American bar should be subjected to examination.

LE GALLIENNE, EVA (1899-), American actress, was born at London, England, Jan. 11, 1899, daughter of RICHARD LE GALLIENNE. She studied for the stage at the Royal Academy of Dramatic Art and made her first appearance at the Queen's Theatre, London, 1914, as a page in *Monna Vanna.* In New York she made her first notable success as Julie in *Liliom* at the Garrick Theater, 1921. Subsequently she played Alexandra in *The Swan,* Hilda Wangel in *The Master Builder* and Ella Bentheim in *John Gabriel Borkman.* She founded the Civic Repertory Theatre, New York, the first production, on Oct. 25, 1926, being Benavente's *Saturday Night.* Thereafter she began to build a large repertoire of plays at that theater including *The Three Sisters, The Master Builder, John Gabriel Borkman, La Locandiera,*

Twelfth Night, The Cradle Song, Inheritors, The Good Hope, Hedda Gabler, The Cherry Orchard, Peter Pan, Romeo and Juliet and *Camille.*

LE GALLIENNE, RICHARD (1866-), English poet and man of letters, was born in Liverpool, Jan. 20, 1866. He was educated at the College of Liverpool and went into business, but turned to literature as a career and eventually settled in America. He published a number of critical essays, edited many books of poetry and prose, but he is best known for his *Religion of a Literary Man,* 1893, *Prose Fancies,* 1894-96, *Painted Shadows,* 1907, *Pieces of Eight,* 1918, *The Junk Man and Other Poems,* 1921, *The Romantic '90's,* 1926, and *The Magic Seas,* 1930. His daughter, EVA LE GALLIENNE, became well-known as an actress.

LEGAL MAXIMS. In the first stage of scientific treatment of law, lawyers began to put differences between superficially related states of fact, to find a principle behind the differences, and to express that principle in an epigrammatic formula or maxim. Maxims in modern law are either inherited or borrowed from the Roman law, or framed in the formative period of modern law after the Roman model. In the Digest of Justinian one of the titles in the last book is "On Divers Maxims of the Old Law." This title of the Digest has been a quarry in modern law. Another quarry has been the maxims of the canon law collected in a title at the end of the text (1298) and entitled "On the Maxims of Law." These maxims of the canon law grew out of university teaching in which the text was made the basis of raising distinctions and solving apparent contradictions on the basis of general principles which were then put in the form of popular proverbial sayings. Maxims grew up through university teaching of the civil law or modern Roman law in the same way. In the common law we find from the beginning certain proverbial sayings expressive of customary law. During the Middle Ages some of these, and some of the Roman and canon law maxims, got a certain currency in judicial decision. In the latter part of the sixteenth century and in the seventeenth century, the development of law writing made itself felt, among other things, in formulation of new maxims. Terse sayings of judges, and what would not be thought of as head notes to reported cases, easily became maxims. Bacon wrote a book of legal maxims in 1596, published in 1630, which has remained a standard collection. In the eighteenth century a collection was made of maxims of equity, one of them at least going back to Aristotle, some of them apparently old sayings in the courts, and many of them phrases borrowed from decisions of Chancellors, analogous to a reporter's head note in a modern law report. These maxims of equity were taken up by text writers and still have much currency. Some of them express policies in the exercise of the Chancellor's jurisdiction, others are formulations of general equity doctrines. For the most part they are blind guides. Unless one knows thoroughly the policy or doctrine in question, the maxim is of little use and often is misleading. The best that can be said for them is that they are convenient ways of referring to certain policies and doctrines. In a certain period of legal development, maxims are much relied upon. But the general feeling to-day is well expressed by a critic who said that they were called maxims because they conveyed a minimum of information with a maximum of pretence.

LEGAL TENDER, the offer of a payment for a debt which cannot be legally refused by the creditor in the absence of a special contract. It is a term usually used in connection with MONEY. PAPER MONEY which has no intrinsic value is often given the legal tender quality in order to force it into circulation. During the Civil War the government of the United States issued GREENBACKS without any provision for redeeming them in coin, but made them practically full legal tender. After 1879, however, they were redeemable in GOLD. The legal tender money in the United States under the present laws consists of gold coins and gold certificates, treasury notes of 1890, greenbacks, silver dollars and subsidiary coins up to $5. The notes of NATIONAL BANKS and Federal Reserve banks are not legal tender, but are redeemable in legal tender money.

In countries on a gold or a gold exchange standard, gold is full legal tender. In many of these countries the notes of the CENTRAL BANK also have the legal tender power. The ability to confer this power upon money which may or may not have intrinsic value is a very dangerous one, and was abused by almost every government during the World War, as on many similar occasions in the past, opening the way to INFLATION and its attendant evils. *See also* CIRCULATING MEDIUM. B. H. B.

LEGAL TENDER CASES, several litigations before the United States Supreme Court affecting the LEGAL TENDER ACT of 1862 whereby the Treasury was enabled, as a war measure, to issue notes, known as Greenbacks, which were legal tender for all debts, except customs duties and interest on the public debt. Chief Justice Chase, who, as Secretary of the Treasury in 1862, had sponsored the measure, in rendering decision on *Hepburn vs. Griswold,* Feb. 7, 1870, declared that greenbacks were not legal tender for contracts made previous to the passage of the law; three of his six colleagues dissented. On the same day two appointments to the supreme bench were named by President Grant for approval of the Senate. The Chase decision enraged important railway companies who had bonds of issues prior to 1862 outstanding. The reconstituted Court, in rendering decision on two other cases involving the legal tender question, May 1, 1871, reversed the previous decision and declared that the legal tender act was constitutional as applied to contracts made before or after its passage (*Knox vs. Lee, Parker vs. Davis*) by a "five to four" decision.

LEGATE, in the Catholic Church an envoy of the pope, empowered to exercise papal prerogatives. In earlier times there were three classes of legates,

legati a latere, missi and *nati.* The first class, *legati laterales,* was restricted to cardinals, who were sent as plenipotentiaries to exercise certain functions of the papacy which were not permitted to the *legati missi* and *nati.* The last class differed in turn from the *missi* in that their legation was once for all united with a specific prelacy, while for the *missi* a special commission was necessary. The constant opposition of the bishops to the sending of legates with at least as much authority as theirs, which had greatly increased the papal power, led to a diminution of the practice, particularly as it became obnoxious also to the modern States. Thus the present legate (*legatus extraordinarius*) and the NUNCIO are now merely diplomatic representatives of the pope, while certain prelates, mostly archbishops of ancient sees, retain the title of *legatus natus* merely as an honorary title.

LEGATO, an Italian term used in musical EXPRESSION to indicate a smooth or flowing manner as opposed to detached tones which are indicated by the term *staccato.*

LEGEND (Latin *legenda,* reading), originally a record or life of a Christian saint which could be read at public gatherings; now the name given to any fanciful story about a person or place which professes to be historical but is merely traditional. Of medieval legends the greatest collection was the *Legenda Aurea* or *Golden Legend* by Jacobus de Voragine (d. about 1298), containing lives of the more important saints. In France and Germany legends were frequently versified in the 13th and 14th centuries, notably by Rudolph von Ems and Hartmann von Aue. With the Renaissance and Reformation legends lost their popularity, although interest in them was revived under ROMANTICISM. In numismatics, the legend is the inscription on a coin.

LEGERDEMAIN, a French word equivalent to the English SLEIGHT-OF-HAND, denoting the art of performing tricks by a swift and dexterous use of the hands, generally without apparatus. The legerdemainist must be adept at concealing coins in his hands, shown to the audience as empty, but rotated with lightning rapidity. He must also know how to engage the audience's attention elsewhere, before an exchange takes place. Some performers go so far as to use hypnotism. Card tricks are another specialty of the legerdemainist. He has been able to accomplish feats claimed to be supernatural by spiritualists and thus proved them frauds.

LEGGE, ALEXANDER (1866-), American business executive, was born in Dane County, Wis., Jan. 13, 1866. In 1881 the family moved to Nebraska and 10 years later Legge began work with the McCormick Harvester Company at Omaha. Working himself up in this concern, he became president of the International Harvester Company, the successor to the McCormick Company, in 1922. This position he held until 1929 when he was appointed chairman of the Federal Farm Board by President Hoover.

LEGHORN (Italian *Livorno*), a city in the northwestern part of the peninsula of Italy, capital and seaport of the province of Leghorn, and seat of a bishop and prefect. It is connected by canal with the Arno, 9 mi. to the north. Included among the 24 religious edifices are Protestant, Greek Catholic, Anglican and Armenian churches, and a large synagogue. Noteworthy buildings are the 17th century cathedral, the church of San Fernando, an old fortress, the former granducal palace, and the city hall. Protected by moles, the old harbor with a 14th century lighthouse was enlarged in 1854, and the new Porto Vittorio was added later. The chief industries include shipbuilding, and the manufacture of cast metal, machines, glass and earthenware, metals, straw hats, rope and articles made of coral. Additional exports include olive oil, wine, candied fruits, borax, soap, hemp, mercury, marble and furniture. The educational institutions comprise advanced schools, a marine and flying academy, nautical institute, meteorological observatory, large communal library museum, four theaters, and a scientific society with a library.

Probably the ancient *Portus Pisanus* or *Portus ad Herculem,* Leghorn passed under the rule of Jacopo Appiano in 1397, then to the Visconti, and later to Florence. In 1593, it became the refuge of persecuted Jews, Protestants and others, and rose to be an important commercial city. Pop 1931, 124,391.

LEGION, a Roman military division, originally three regiments of 1,000 men each, but by the 2nd century B.C. a force of 30 maniples, double centuries, totaling 4,200 men. Service was at first restricted to patricians; Servius admitted plebeians. When Romans began to regard military duty as a burden, Marius replaced conscription by voluntary enlistment, opening the way for the professional or mercenary soldier, attached to the leader rather than to the state. Old classifications, as heavy-armed, light-armed, etc., disappeared; legions were regularly composed of 10 cohorts, given a standard, named and numbered, often becoming a permanently stationed force. Under the Empire legionaries of the standing army served 20 years, then received land grants. The legions numbered from 25, under AUGUSTUS, to 33, under Septimius Severus, and more, normally of 5,600 men each, to which was normally added a cavalry detachment; they were commanded by legates or prefects.

LEGION OF HONOR, THE, was founded by Napoleon Bonaparte in 1802 for the award of special recognition to those who had rendered distinguished service to France in War, civil service of the state, diplomacy, letters, art or science. Members of the Legion are named by the government, a certain annual quota being allotted to each ministry. The members are divided into five different classes: Chevalier (Knight), Officer, Commander, Grand Officer and Grand Cross. The President of the Republic is Grand Master and nominal head of the order. The real head is the Grand Chancellor who is always a military or naval officer. The estimated membership in 1922 was 142,000 which included 22,000 foreigners.

LEGISLATION, a term used to denote the legal enactments of sovereign law-making bodies; the term

ordinance is usually applied to the decrees of subordinate legislative or administrative bodies. In a broader and less technical sense it means the creation of law by statute rather than by custom and judicial interpretation. For analysis of the legislative process, *see* CONGRESS.

LEGISLATIVE BLOC, a coalition formed usually for the purpose of passing class legislation. The most outstanding example in the United States in recent years is the Agricultural Bloc which came into existence in the Senate at the outset of the Harding administration. Though feared by conservative politicians as a development destructive of the two-party system, the bloc may well represent a progressive tendency. The term is often applied in a hostile sense, yet many legislative groups have been and are blocs in all but name. The term itself originated in the legislative practices of certain European countries, specifically France and Germany.

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LEGITIMISTS. *See* ORLEANISTS.

LEGNANO, BATTLE OF. *See* LOMBARD LEAGUE.

LEGOUVÉ, ERNEST WILFRIED (1807-1903), French writer and dramatist, was born in Paris, Feb. 5, 1807. In 1827 he gained the prize for poetry given by the French Academy. For some time he worked as a novelist, but in 1848 began writing plays. In collaboration with A. E. SCRIBE, he wrote *Adrienne Lecouvreur* in 1849, a play that met with phenomenal success. The tragedy *Médée* was written for Ristori. Legouvé also wrote many successful comedies. In 1885-87 his charming *Reminiscences* appeared. He was famous for his faultless taste and style as a lecturer, and his public readings have been described as "inspired." Legouvé died in Paris, Mar. 14, 1903.

LEGUIA AUGUSTO B (1863-1932), Peruvian President, born in Lambayeque, Feb. 19, 1863, of a distinguished Peruvian family. He studied in Valparaiso. In 1888 he was engaged in insurance business in Ecuador. In 1903 he became minister of finance and served under successive presidents until 1908, when he was elected president. In 1913 he went to London, returning to Peru in 1919 and participating in the revolution of July 4. He governed until September as provisional president, and then was elected constitutional executive. He remained in office, being reelected, until 1930, when he was overthrown by a revolution. Leguia exercised dictatorial powers in the realization of a vast program of reforms and improvements, borrowing extensively from abroad and imposing a heavy debt on the country. He died in 1932.

LEGUME, or true pod, a dry fruit, which at maturity splits along both sutures into two valves. This fruit is characteristic of the plants of the pea family (*Leguminosae*). The term legumes is applied to the seeds and young pods of these plants used for food, as peas and beans, and also to the plants themselves. In French the word *legume* is used in a general sense to indicate any vegetable.

LEGUMINOUS PLANTS, the general name for a very numerous and important family (*Leguminosæ*) of flowering plants. The group, which ranks as one of the two or three largest plant families, comprises some 600 genera and 12,000 species. They are readily distinguished by their characteristic fruit, which is typically a LEGUME or true pod. In a limited number of species, however, the fruit becomes a loment or is otherwise modified. Although very widely distributed throughout the world, the species are most numerous in the tropics. In habit they vary immensely, embracing trees, shrubs, herbs, desert plants, water plants and climbers. On their roots peculiar small structures called tubercles are almost invariably found. These contain certain bacteria (*Rhizobium* sp.) which have the power of absorbing nitrogen from the air and transforming it into plant food. In consequence leguminous plants, especially crop plants such as peas, clovers and alfalfa, enrich the soil in which they grow.

Because of differences in the structure of the flowers the Leguminosæ are divided into three sub-families: 1. the pea tribes (*Papilionatæ*) or Leguminosæ proper, with irregular, butterfly-like flowers; 2. the senna tribes (*Cæsalpiniæ*), with somewhat irregular flowers, mostly tropical; 3. the mimosa tribes (*Mimoseæ*), with small regular flowers, also chiefly tropical. By some authorities each of these sub-families is regarded as a family, the first being called the pea family (*Fabaceæ*); the second, the senna family (*Cæsalpiniaceæ*), and the third, the mimosa family (*Mimosaceæ*).

To the *Leguminosæ* belong a large number of highly useful plants, among which are 1. food plants, as the bean, pea, chick pea and lentil; 2. forage plants, as alfalfa, clover, cow pea, sainfoin and vetch; 3. dye plants, as brazil wood, indigo and logwood; 4. varnish plants, as copal and copaiba; 5. gum plants, as gum acacia, gum kino and gum tragacanth; 6. medicinal plants, as balsam of Tolu, Calabar bean, catechu, fenugreek, licorice, senna and tamarind; 7. ornamental plants in immense variety. The group contains a limited number of poisonous plants, as laburnum, loco weeds and arrow poisons. A. B. J.

LE HAVRE, an important seaport, the second in France, situated at the mouth of the Seine at a distance of 44 mi. west of Rouen. Its prosperity dates from the fortification of the harbor in the 16th century by Francis I, who developed the port around the sailors' chapel of Notre Dame de Grâce and called it Havre meaning harbor. VAUBAN's engineering under Louis XIV made the port accessible to large vessels. During the World War the Belgian government had its headquarters in a nearby suburb, and the port was a British and American base. Le Havre handles nearly one-fourth of the maritime commerce of France and is the chief French port for cotton and coffee. It is the home port of the Compagnie Générale Transatlantique and a center for world wide shipping. Its varied industries include shipbuilding and the manufacture of machinery and chemical works, oils and dyes. Pop. 1931, 165,076.

LEHIGHTON, a city of Carbon Co. in eastern Pennsylvania on the west bank of the Lehigh River, about 26 mi. northwest of Allentown. It is served by two railroads, by a canal and by a bus line. Coal mining is the chief occupation. There are shirt, silk and lace factories, meat packing plants, stoneworks and brickyards in the city. The main car shops and distributing yards of the Lehigh Valley Railroad are located here. Lehighton was settled about 1746 and incorporated in 1866. Pop. 1920, 6,102; 1930, 6,490.

LEHIGH UNIVERSITY, a privately controlled institution for men at Bethlehem, Pa. It was chartered in 1866 as a result of a movement inaugurated by the Hon. Asa Packer of Mauch Chunk to provide an institution that would afford education in the learned professions and in technical branches. The university had productive funds in 1931 amounting to $5,285,000. The library of 196,616 volumes contains the Eckley B. Coxe Library of Early Science, the Joseph W. Richards Library of Metallurgy, and a Civil War Collection. In 1931-32 there were 1,469 students, and a faculty of 185, headed by Pres. CHARLES R. RICHARDS.

LEHMAN CAVES, a national monument in east central Nevada near the Utah boundary line. An area of 593 acres was set aside Jan. 24, 1922 to preserve a series of remarkable caves. The monument is under the jurisdiction of the Department of Agriculture. Of light-gray and white limestone, the caves are a series of chambers and galleries connected by an intricate network of tunnels. The monument is but a few miles north of Baker, Nev. and approximately 60 mi. by state highway from Ely which is on the Nevada Northern Railroad and a U.S. Interstate Highway.

LEHMBRUCK, WILHELM (1881-1919), German sculptor, was born in Duisberg-Meiderich, Germany, Jan. 4, 1881. By many authorities he is considered to have been the foremost German sculptor of the latter 19th and early 20th centuries. His works in America include: figure of a woman, Brooklyn Institute of Arts and Sciences; head, Albright Art Gallery, Buffalo; standing female figure, Detroit Institute of Arts; standing woman, Museum of Modern Art; and torso of a woman, Hillyer Art Gallery, Smith College, Mass. Lehmbruck died in Berlin, Mar. 25, 1919.

LEIBNITZ, GOTTFRIED WILHELM (1646-1716), German philosopher, mathematician and jurist, was born at Leipzig, July 1, 1646. Studying at Leipzig and Jena, he received the doctorate in law and prepared for a political career. Leibnitz held a number of public offices and was the recipient of many titles but is best known for his work as a philosopher and mathematician. Together with ISAAC NEWTON he shares the honor for having invented the calculus, although the two worked independently of each other. Among his numerous philosophical writings the *Monadology,* 1714, and the *New Essays on the Human Understanding,* 1765, are the most important. In 1698 Leibnitz went to Berlin and there established the Scientific Society which later grew into the university. He died Nov. 14, 1716.

Considering the circumstances under which Leibnitz lived it is not surprising that he should have been an optimist. He believed everything was for the best in the best of all possible worlds. In modern thought he is the father of idealism, the monad being essentially a spiritual element. To him is also due the beginning of apperceptive psychology.

LEICESTER, ROBERT DUDLEY, EARL OF (c. 1532-88), English courtier, fifth son of John Dudley, duke of Northumberland, was born in 1532 or 1533. After the execution of his brother, Guildford Dudley, husband of Lady Jane Grey, Robert Dudley was himself sentenced to death as an accessory in the criminal designs of his father, but he was pardoned by Elizabeth, who made him master of the horse when he was 27, and in 1564 created him Earl of Leicester. She awarded him command of the expedition to the Low Countries in 1585, and at various times it was said that Elizabeth intended to marry Dudley. His friendship with the imprisoned MARY QUEEN OF SCOTS did not lessen the favor he enjoyed with Elizabeth, who in 1588, after recalling him from the Low Countries, appointed him lieutenant general of the forces gathered at Tilbury to resist the Armada. The charge that Dudley was involved in the sudden death of his wife, Amy Robsart, at a time when the court believed Elizabeth seriously considered marriage to him, was never substantiated. He died at Cornbury, Oxfordshire, Sept. 4, 1588.

LEICESTER, a city of Leicestershire, England, situated on the Soar, 22 mi. east of Nottingham and 97 mi. northwest of London. The city was founded by King Lear, and Roman pavements and a wall 20 ft. high and 75 ft. long, built of Roman rubble and bricks, have been discovered.

Throughout its history as a manufacturing town, Leicester has been one of the chief seats of the woolen industry of England. This preeminence is no doubt due in large measure to the fact that the Leicestershire breed of sheep yields one of the finest wools for the making of worsted yarn, and more recently to its lying on a coalfield which supplies power. The making of lace and elastic webbing has been added to the city's textile industries, and the manufacture of plain and fancy hosiery, introduced in 1680, is still important. There are several fine buildings, monuments and parks in the city. St. Margaret's, a large and beautiful church of the 15th century, adjoins the abbey where Cardinal Wolsey died in 1530. St. Mary's Church dates from the 12th century. Pop. 1921, 234,143; 1931, 239,111.

LEICESTER, a town including Leicester and two smaller villages in Worcester Co., central Massachusetts. Leicester village is situated on the Blackstone and French rivers, about 6 mi. southwest of Worcester. It is served by one railroad, motor-buses and a trolley line. The chief manufacture is woolen goods. The town was settled in 1713 and incorporated in

1722. ELI WHITNEY, inventor of the cotton gin, attended Leicester Academy, established in 1783. Pop. 1920, 3,635; 1930, 4,445.

LEIDEN. *See* LEYDEN.

LEIGH, a municipal borough of Lancashire, England, 21 mi. northeast of Liverpool. Although situated in an industrial area, several notable old houses and a church survive. Leigh manufactures real and artificial silk, glass and cotton. Breweries, iron foundries and coal mines are found in the neighborhood. Pop. 1921, 45,532; 1931, 45,313.

LEIGHTON, FREDERICK, LORD (1830-96), English painter and sculptor, was born at Scarborough, Dec. 3, 1830. Although he received his art education largely in Germany, his tastes were Italian and his aim in art was to revive the classic tradition. *Dante in Exile,* dated 1864, is the best known of his paintings of Italian subjects. Leighton's other works were idealized female types, biblical works and an occasional male portrait. He was an excellent draughtsman but somewhat insipid as a painter. His few sculptures show a keener sense of reality than his numerous canvases. Lord Leighton died at London, Jan. 25, 1896.

LEIGHTON HOUSE, in Holland Park Road, Kensington, London, England, the former residence of Frederick, LORD LEIGHTON, the British artist, now a public museum. Perhaps the most interesting room in the house, which was designed in the Oriental style by G. Aitchison, is the Arab Hall, dating from 1879. Leighton House contains collections of eastern works of art and of British sketches and paintings. It is the headquarters of the Oriana Madrigal Society.

LEIPZIG, the largest city of the German free state of SAXONY, located in a low plain at the confluence of the White Elster, Pleisse and Partha rivers.

The old part of the city surrounds the market place on which stands the old rathaus. The main streets are the Peter's and the Grimmaische-Strassen. This section is surrounded by circular streets, promenades and seven squares, adjoining which are the newer parts of the city. The suburbs on the west are separated from the nucleus by woods, meadows and parks in the valley of the Elster and Pleisse. Farther away are fine villa sections. The factory districts are in the north, east and northeast.

Noteworthy among the 41 Protestant, 5 Catholic and 2 Hebrew churches are the Thomas Church, 15th century; Matthew's, 15th century; Nicholas Church 12th century; University Church, 13th century, and St. John's Church, 16th century, which contains the tombs of JOHANN SEBASTIAN BACH and Christian F. Gellert. The most important of the secular buildings are the old rathaus, 16th century; the Princes' House, 16th century; the Old Theater, 18th century; Thuringian Court, 16th century; the Pflugk House, 15th century; Red College, 16th century; and other fine houses of the 16th to 18th centuries. Of the newer buildings, the most prominent are the university, the New Theater, Reichsgericht, or the supreme court of Germany, Central Station, University Library and German Book House. There are other fine buildings devoted to trade and publishing and also many buildings for the annual fairs, among them a subterranean structure beneath the market place. Besides the squares around the Promenade Ring, there are several others with monuments, including the Volkerschlachtdenkmal in memory of the Battle of Leipzig, at which Napoleon was defeated; the monument to Goethe, who was a student there, and the Luther-Melanchthon monument. Apart from the Ring, there are ten other parks in various sections of the city.

Leipzig is the largest Saxon industrial city and one of the greatest commercial centers of Germany. It is in the midst of a brown coal area, and the chief industries are metals and machines, textiles, food products, clothing, leather and rubber goods. It is the center of the German book business with paper factories and book binding, lithographing, printing and sheet music firms. The trade is chiefly in furs, books, sheet music, wool, yarn, cloth, leather, groceries, food products, metals, machines, paints and drugs. The great sample fairs are held in the spring and fall in 100 halls and "palaces." Ten railroad lines pass through the city and there are two airports.

The establishment of the University in 1409, one of the foremost in Germany, brought additional prestige and activity to the city and led to the establishment of other educational institutions, especially in connection with business and industry. Some of the largest libraries on the continent as well as 11 museums are located here. There are six theaters and the Gewandhaus, famous for its fine concerts.

Leipzig was a Slavic settlement in 1000, but the road on which it lay soon became an artery of trade from Halle to Nuremberg, Poland and Silesia, so that sample fairs were held there as early as the 14th century. The emperors favored the city and it became an important center of finance and trade. Pop. 1925, 679,159.

LEIPZIG, BATTLE OF, called the Battle of the Nations, an engagement on Oct. 16-19, 1813, between Napoleon Bonaparte with 214,000 men against Austria, Russia, Prussia and Sweden with 325,000 men. On Oct. 16 the Austrians under Schwarzenberg attacked, and by attempting an impossible flank movement nearly gave Napoleon the victory. When the Austrian attack failed, Napoleon countered, but could not break through the allied center. Blücher's Prussians forced Marmont to yield ground, and Bertrand drove back Gyulay. On the 17th Napoleon sent overtures of peace to Austria in the hope of detaching her from the alliance. But Austria declined the terms, and the four allies firmly cemented their alliance. On the 18th the battle was resumed. During the day, in which the fighting was the fiercest of the entire engagement, the French were pushed back at all points except where Napoleon himself commanded. When 35,000 Saxons deserted to the enemy, Napoleon ordered a retreat, and the army crossed the Elster River over a single bridge. However, the rear guard was

cut off on the 19th, and those who could not swim were drowned or slain. The allies took 20,000 French prisoners.

LEIPZIG, UNIVERSITY OF, at Leipzig, Germany, one of the most important universities in Europe. Under the patronage of Frederick the Quarrelsome of Meissen, it was founded, in 1409, for 40 German teachers and 400 German students who had seceded from the UNIVERSITY OF PRAGUE, following a decree which had transferred the power in that university from the Germans to the Bohemians. Its constitution and statutes were based largely on those of Prague. In 1539, under the influence of Melanchthon, the university's sympathies with humanism were promisingly extended. In 1559, however, new statutes were made which so lowered the academic standards that a period of stagnation set in, not to be broken till 1830, when a complete reorganization was effected. The present institution, which became a syndicate in 1893, receives handsome revenues from house property in Leipzig and estates in Saxony, besides state aid. It has faculties of law, medicine, theology and philosophy. The students number about 4,500. The buildings, mostly modern, include a renowned library of 570,000 volumes. In 1930 the rector was Prof. Friedrich Falke.

LEITH, or **PORT OF LEITH,** on the south shore of the Firth of Forth, the second port of Scotland, about 1 mi. northeast of Edinburgh with which it was incorporated in 1920. Once a walled town fortified by French supporters of Mary of Lorraine about 1550, little remains of the old Leith to which so many sovereigns returned from exile. Aside from shipping activities of the great harbor, covering many acres, Great Britain's whiskey trade is centered here. Shipbuilding has long been important, and, among other manufactures, are rope and twine making.

LELAND, CHARLES GODFREY (1824-1903), American author, was born in Philadelphia, Pa., Aug. 15, 1824, and graduated in 1845 at Princeton University. After further study abroad he engaged in writing and editorial work in Philadelphia, New York City and Boston, and, in 1861, established in Boston the *Continental Magazine* as an organ against slavery. He was a student of gypsy folklore and published several studies of their languages and customs. In addition he wrote *Hans Breitman's Party, Egyptian Sketchbook, Algonquin Legends of New England* and *The Minor Arts.* Leland died at Florence, Italy, Mar. 20, 1903.

LELAND STANFORD JUNIOR UNIVERSITY, THE, a coeducational institution, situated near Palo Alto, Cal., treated under the heading STANFORD UNIVERSITY.

LE LOCLE, a town of Switzerland, in the canton of Neuchâtel. It is one of the two main centers of the watch industry and has three churches, two colleges, a commercial school, trade school, technological institute and watchmakers' school. In many homes and in large factories, 2,400 people make over 140,000 watches annually. Pop. 1930, 12,075.

LEMAIRE DE BELGES, JEAN (c. 1473-1525), French poet and chronicler, was born in Hainault, Flanders, in 1473. He entered the service of Marguerite of Austria, whom he had glorified in his *Couronne Margaritique.* This panegyric, however, was not published until 1509. Meanwhile, in 1506, he had again sung the praises of the princess in his renowned work, *L'Épître de l'amant vert.* Subsequently attached to the service of Queen Anne of Austria, at the French court, he dedicated to her his *Illustrations de Gaule,* 1511-13. During a long sojourn in Italy he made profound studies of the languages and literatures of the Greeks and Romans. He also steeped himself in the Italian language and literature, and in his *Concorde des deux langages* advocated the amalgamation of the French and Italian tongues. Lemaire de Belges died about 1525.

LEMAÎTRE, JULES (1853-1914), French critic and dramatist, whose full name was François Elie Jules Lemaître, was born at Vennency, Loiret, Apr. 27, 1853. Abandoning teaching for literature, he was quickly recognized as one of the leading critics of his day. His articles, which were remarkable for their brilliance, wit, originality and fresh point of view, were later published in several volumes under the title *Les Contemporains.* His dramatic criticisms were reprinted under the title *Impressions de Théâtre.* Several of his plays were produced in Paris, but the fame of Lemaître is that of the critic and not of the playwright. He died at Tavers, Aug. 5, 1914.

LE MANS, a city of northwestern France, celebrated for its beautiful Romanesque and Gothic cathedral. Henry II of England was born in Le Mans, and the town, often besieged, was historically important. In the square below the cathedral is a monument to Wilbur Wright, who made important experiments in aviation nearby. Le Mans is a center of metallurgical industries and of trade in agricultural products. Formerly capital of Maine, it is now the capital of the department of the Sarthe. Pop. 1931, 76,868.

The Cathedral of St. Julien at Le Mans is probably the most notable French example of the blending of Romanesque and Gothic architecture, and is additionally celebrated for the beauty of the stained glass in its choir and the ancient windows of its nave. The Romanesque nave was completed in 1158, and was itself a rebuilding of an earlier church of the 11th and 12th centuries. Inspired by the Gothic splendors of the Ile de France, however, especially by the Cathedral of Chartres, the bishop and canons of Le Mans determined to meet the new developments of architecture, and in 1217-54 the old Romanesque apse was replaced by the magnificent Gothic choir. The transepts were begun in the 14th and completed in the 15th century.

The west front of the cathedral is relatively unimpressive. The apse, however, girdled with 13 projecting chapels, is one of the finest in the world, and the view from the square below, which shows the

flying buttresses to great advantage, is unforgettable. The dignity and beauty of the Romanesque nave spring chiefly from the stained glass of the late 11th and early 12th centuries. One window, depicting the Ascension, is possibly the oldest in France. In the choir the architectural splendor of 13th-century Gothic is superbly complemented by the many-colored glass of the windows. The south transept has a magnificent rose window dating from 1430. Henry II of England was baptized in the cathedral of Le Mans, and Berengaria, queen of Richard the Lion-Hearted, is buried there. A chapel is dedicated to Ste. Jeanne d'Arc in appreciation of the cathedral's escape from injury during the World War.

LE MARS, a city in northwestern Iowa, the county seat of Plymouth Co., situated on the Floyd River, 25 mi. northeast of Sioux City. Bus lines and two railroads afford transportation. The city is a market and shipping point for the grain grown in the region. Western Union College has its seat here. Le Mars was founded in 1870 and incorporated in 1881. Pop. 1920, 4,683; 1930, 4,788.

LEMBERG or **LWOW,** the largest city in eastern Poland, capital of the voievodship of the same name, 365 mi. northeast of Vienna; situated in a deep valley on the Peltew, a small tributary of the Bug River. The city was founded in the 13th century and many magnificent churches and cathedrals, as well as monasteries and convents, still exist as evidence of its distinguished past. One of the finest churches is the 14th century cathedral, rebuilt in the 18th century in the Rococo style. Lemberg is rich in antiquities and museums, the largest being the Municipal Picture Gallery, the Historical Museum of the Town of Lemberg, the King Sobieski Museum, the Industrial Art Museum, the Ossolinski Museum and Library, the Dzieduszycki Natural History and Ethnographic Museum and the Lubomierski Picture Gallery. The Kilinski Park is considered the finest public park in Poland. In the vicinity of the park are a number of buildings in which the annual Eastern Fairs are held in the second week of September. Lemberg is the only city that has three Catholic cathedrals of three different rites, the Roman Catholic, the Greek and the Armenian. It is an important educational center with a well-known university. The Skarbek Theater is the musical and theatrical center of Lemberg. Trade is mainly in the hands of the Jews, who engage in the manufacture of machinery, textile goods, liquors and tobacco. During the Middle Ages Lemberg was a thriving center for trade with the East. About one-fourth of the population are Jews. Est. pop. 1930, 240,725.

LEMMING, a name given to several small related rodents: the Norwegian lemming (*Lemmus lemmus*); the lemming of the Arctic regions of both hemispheres, which is particularly abundant in northwestern America; the Siberian lemming; the banded lemming, which turns white in winter and possesses double claws on one of the toes of the fore feet; the false lemming of the United States and Canada, and several other American rodents. The Norwegian lemming is famous for its migrations. At intervals of about 5 to 20 years vast swarms leave their homes in the fells of the central mountain chain of Scandinavia and, traveling usually west, descend to the



EUROPEAN LEMMING
Lemmus lemmus

lowlands. They may continue straight for the sea, into which they plunge and are drowned. No obstacle, whether lake or sea, deters them. In their wake they leave devastated crops. Birds and animals



HUDSON'S BAY LEMMING

of prey and man all attack them. Yet so prolific are they that a tremendous number of them reach the sea. The migrations may last several years. The Norwegian lemmings form nests of bark or grass in the tunnels that they make underneath the snow in search of food.

LEMNIAN, an extinct language preserved in two inscriptions in Greek letters of the end of the 6th century B.C., discovered in 1886 on the island of Lemnos. Its linguistic affinities are uncertain, the most probable connection being with ETRUSCAN.

LEMNISCATE, a curve discovered by Jacques (Jakob, James) Bernoulli (1694). Its Cartesian equation $(x^2 + y^2)^2 = a^2(x^2 - y^2)$, and its polar equation is $r = a \cos 2\phi$. It is also called the hyperbolic lemniscate. The general lemniscate has for its equation $(x^2 + y^2)^2 = 2a^2(x^2 - y^2) + b^4 - a^4$ and is known as Cassini's Oval, after Giovanni Domenico (Jean Dominique) Cassini, who described it in 1680. *See* CURVES; BERNOULLI.

LEMNOS or **LIMNOS,** an island of the Grecian Archipelago in the Aegean Sea, about halfway between Mt. Athos and Mysia. It is about 150 sq. mi. in area and is hilly and volcanic. It was sacred to Hephaestus and one of its chief towns was named for the god, Hephaestia. Lemnian earth was celebrated for its medicinal qualities. The island belonged at different times to Athens, Macedon, Greece, and Italy

and was finally taken by the Turks in 1478. Lemnos is in a region that, since the World War, has been termed the Zone of the Straits and is under the Inter-allied Commission of Control.

LEMON, a small tree (*Citrus Limonia*) of the rue family, grown for its acid fruit. From its original home in India it was disseminated by the Arabs throughout western Asia whence the Crusaders brought it from Palestine to southern Europe. There it has since found a congenial home, especially in Sicily, Spain and Portugal which export immense quantities of the fruit.

Previous to 1894 the lemon industry of Florida had an annual output of about 150,000 boxes but the freeze of that winter, and the development of anthracnose, a fungous disease that appears as brown spots on the fruit, so discouraged the growers that the output in 1901-2 was scarcely more than 1,000 boxes. Lemon growing in that state is limited to the frost-free southern tip where it is becoming reestablished, especially since methods of orchard heating during cold weather and the control of anthracnose are now understood. In California the best lemon growing districts are near the coast in the southern part of the state where the cool, moist summer climate favors the production of high priced summer-ripening fruit. Lemon trees in the hot interior valleys grow as well as those near the coast but ripen their fruit mostly during the winter while prices are low. Moreover, such fruit neither ships nor keeps so well as the coastal product.

As the lemon is more sensitive than the orange to cold great care is necessary in the selection of orchard sites. A few warm days during winter will start new growths which being sappy will be easily injured by subsequent cold weather. For this reason the sites chosen must have good air drainage. In sections where frost may be expected provision must be made for orchard heating, preferably with oil because of its convenience, economy and freedom from soot when properly regulated. Orchard planting and management is much the same as for oranges, except that lemon trees require far more attention in pruning.

Lemons are gathered while still green, when they have attained a certain size, and the gathering continues during practically the entire year. All fruits are cut from the trees when they are too large to pass through a metal ring carried by each picker. The pickers wear cotton gloves and place the fruit carefully in canvas picking bags. In these the fruit is taken to a storage house where it is washed in copper sulphate solution as a preventive of decay. The spring crop is piled loosely in boxes, which are stacked beneath canvas tents, each covering a carload. These tents control ventilation and evaporation, being raised in muggy weather and lowered when the air is dry. The autumn crop is placed in a fire-proof building where it is artificially ripened by kerosene stoves stationed in the basement. During the curing process lemon skins become somewhat thinner, leathery, more pliable, less liable to decay and more attractive in appearance than those normally ripened on the tree. M. G. K.

LEMONADE BERRY (*Rhus integrifolia*), a shrub of the sumac family native to southern and Lower California, often forming dense thickets along the coastal cliffs. It grows usually from 2 to 12 ft. high, though it occasionally becomes a small tree 30 ft. high, bearing leathery leaves, small pink flowers in dense clusters and flattened berry-like drupes covered with a pleasantly acid, ice-like flesh. The fruit is used in preparing cooling drinks.

LE MOYNE, CHARLES (1626-85), Canadian pioneer, was born in Dieppe, France, in 1626. When 15 years old he came to Canada and settled at Villemarie where he took a leading part in building up the colony, several times successfully defending it against the Iroquis and other hostile Indians. He died at Villemarie in 1685.

LEMPA RIVER, a navigable stream of Salvador, Central America. It rises in Guatemala and on its course eastward through Salvador receives several tributaries from Honduras. By bending southward it enters the Pacific Ocean through a broad estuary faced by islands. Because of a shallow bar at its mouth, the Lempa cannot be entered by seagoing vessels. It is nearly 200 mi. long and drains an area of 6,000 sq. mi.

LEMUR, an inferior primate of the family *Lemuridæ*. The lemurs form a large group of interesting and usually beautifully furred arboreal animals, living in Madagascar, tropical Africa, and Indo-Malaya. They are distinguished from monkeys by their elongated jaws, giving a foxlike aspect to the face, the simplicity of the brain structure, and other anatomical features betokening a lower grade of development and intelligence. The group falls very naturally into three families: *Tarsiidæ, Daubentoniidæ* and *Lemuridæ,* the last-named containing all but two species. Their queer appearance and mysterious cries have given lemurs a large place in the fears and superstitions of native peoples, especially in Madagascar. *See* LORIS: TARSIER.



HANDED LEMUR

LENA, a river of Asiatic Russia rising in the Baikal Mountains of eastern Siberia and flowing about 2,800 mi. to the Arctic Ocean, into which it falls by several mouths to form a delta 250 mi. wide. From Yakutsh to its delta, the Lena has a breadth of from two to four mi., which is increased in the flood sea-

son to over 50 mi. through long stretches. During the summer river steamers ply on the Lena from near its source to the Arctic. The few settled inhabitants of the Lena basin live in clearings and glades along the banks. Gold is dredged from the beds of the tributaries, Vitim, Olekma and Aldan.

LENARD, PHILIP VON (1862-), German physicist, was born at Pressburg, June 7, 1862. In 1894 he became professor of physics at Breslau, in 1895 at Aachen, in 1896 at Heidelberg, in 1898 at Kiel, and in 1907 returned to Heidelberg. His researches were related to problems of radiation, cathode rays, the scattering of particles by ultra-violet light, and phosphorescence. In 1905 he received the Nobel Prize in physics.

LENAU, NIKOLAUS NIEMBSCH (1802-50), Austrian poet and physician, whose real name was Nikolaus Franz Niembsch von Strehlenau, born at Csatád, Hungary, Aug. 13, 1802, and educated at Vienna. A confirmed agnostic from his youth, he found his consolation in Nature, and especially in the autumnal season. His style was exquisitely lyric, with an unrivalled mastery of the language. Among his important works are *Gedichte* and *Neuer Gedichte.* Lenau went to America, in 1832, believing it to be the Promised Land, but, finding the country unsympathetic to his poetic temperament, returned to Germany. The poet died at Oberdöbling, Aug. 22, 1850.

LENBACH, FRANZ VON (1836-1904), German painter, was born at Schrobenhausen, Bavaria, Dec. 13, 1836. He studied with Piloty, was for a short time instructor of painting at the Weimar Academy, and in Italy made copies of famous paintings for the collection of Count Schack. His most notable works are his excellent male portraits of the important Germans of his day, those of Bismarck, Moltke and William I being the most striking. Lenbach died at Munich, May 6, 1904.

L'ENFANT, PIERRE CHARLES (1754-1825), French-American architect and engineer, was born at Paris, Aug. 2, 1754. He came to America with Lafayette in 1777, and volunteered for American service as soldier and engineer. He built Fort Mifflin in the Delaware river, remodelled the City Hall in New York, and also the Federal House in Philadelphia. Appointed architect of the capital in 1791, he constantly disagreed with Washington and Jefferson, and was finally dismissed, but the present-day beauty of the city is largely due to his plans. His method of relieving the monotony of a checker-board street plan by the insertion of numerous avenues running across the city at acute angles was followed by his successors with magnificent results. L'Enfant died in Prince George County, Md., June 14, 1825.

LENIN, VLADIMIR ILYICH ULIANOV (1870-1924), Russian Bolshevist leader, was born in the city of Simbirsk on Apr. 2, 1870. His father, the son of an Astrakhan merchant, was a public school supervisor, while his mother's family were of German extraction. The political atmosphere of the family was liberal. Of the six children, Alexander the oldest, was the most gifted. During his university career in St. Petersburg (Leningrad), he became identified with a Terrorist group, and was executed in 1887 for participation in a plot against Alexander III. In spite of his brother's revolutionary career, Vladimir had no difficulty in entering the University of Kazan, from which he was expelled for participation in a prohibited assemblage. About this time began his interest in Marxian theory. After finally taking a law diploma in St. Petersburg, Vladimir returned to legal practice at Samara where he began his writings on social and economic theory. In Samara as in St. Petersburg, to which he moved in 1893, his legal activities were subordinate to his interest in the spread of Marxian doctrine. At the northern capital, he affiliated himself with the local Marxian group, in which he met his future wife, Nadezhda Krupskaya, and came into contact with the local factory workers through the party agencies for the promotion of literacy. Even at this early date he was preaching the Messianic mission of the Russian proletariat and was hostile to the slightest compromise with bourgeois ideology.

In 1895, Lenin first went abroad and placed himself in contact with exiled revolutionaries of radical conviction. Arrested in St. Petersburg the next year for publication of a revolutionary periodical, he was sentenced to Central Siberia for three years. During his exile, he wrote *The Development of Capitalism in Russia,* published in 1899, and was elected *in absentia* as editor of a new official organ projected by the Russian Social Democrats. At the conclusion of his sentence, he went abroad once more in 1900 to discuss, with Plekhanov and other Social Democrats in Switzerland, the plan for a Social Democratic newspaper. This journal, styled *Iskra* (The Spark), was first established at Munich and later moved to London, where the editorial staff was joined by Leo Trotzki. Lenin's tenacity gradually undermined Plekhanov's control of the paper, which exercised a marked influence on the genesis of the upheaval of 1905 as the chief revolutionary sheet of the period. At the time of the first Social Democratic convention at Brussels in 1903, the *Iskra* group split on their program; the resulting division created for the first time a majority element, the *Bolsheviki,* and a minority section, the *Mensheviki.* Lenin and Plekhanov belonged to the former, but the latter had the support of the bulk of the party, so that Lenin's influence was momentarily weakened, especially when Plekhanov went over to the Mensheviks. Lenin was thus forming a new Bolshevik group when Bloody Sunday, Jan. 22, 1905, heralded the revolution of 1905. In the absence of the Menshevik leaders, who had been arrested at Moscow, Lenin's faction controlled the third Social Democratic convention at London in May 1905. This meeting stressed, for the first time, the cooperation of proletariat and peasantry, as realized in 1917. In view of his absence abroad Lenin's direct influence in the revolution was at first slight, though Trotzki, still identified with the Mensheviks, was a prominent figure in the Soviet of Labor

Deputies formed at St. Petersburg in October of 1905. Lenin himself returned to Russia in November, but the general strike which he inspired ended in failure as a consequence of weak party organization and finances.

Lenin eventually felt that the successful repressive measures initiated by Stolypin, the revolutionary premier, had definitely committed Russia to a peaceful bourgeois evolution, but believed that the weakness of the autocracy lay in its failure to solve the agrarian problem. He, therefore, based his hopes of future revolution on the conversion of the peasants. The apparent triumph of the bourgeois liberals in Russia also weakened the Bolshevist group. It was not until 1911 that its strength revived, partly through growing distemper among the Russian workers and partly through the perfection of Lenin's own party organization with Zinovyev and Kamenev as his aides. The native labor unions also grew in numbers and influence. Having lived in exile since 1905, Lenin established Bolshevist headquarters in Galicia in 1912, and, by the time of the outbreak of the World War, was in full control of the party mechanism. Moving to Switzerland in September of 1914, he had already branded the patriotic attitude of the German Social Democrats as the end of the Second Internationale. As soon as the Russian revolution broke out in March 1917, Lenin approached the German authorities for permission to cross their territory, and was in St. Petersburg, now called Petrograd, on April 16. He began hostilities against the bourgeois Provisional Government, advocating a republic of Workers and Peasants Soviets with transfer of power into the hands of the proletariat. From the split between Kerenski and Kornilov in August 1917, Bolshevist influence began to rise rapidly. Lenin now came out of the retirement which he had sought in Finland in July when Petrograd became "too hot" for him, and, with the last Provisional Government in a state of comatose indecision, the Bolsheviks took over the power on November 7.

As chairman of the Council of People's Commissars, Lenin now bent his efforts to the conclusion of peace with the Central Powers, the elimination of counter-revolutionary groups and alleviation of the economic crisis. The peace of Brest-Litovsk took care of the first problem, and the Red Terror solved the second. But ill-considered measures of nationalization, depreciating currency, paralysis of transportation and distribution, decline of labor efficiency, the suppression of the constitutional assembly and the threat of advancing "White" armies and foreign intervention still made Russia a chaos. The Third (Communist) Internationale was founded in Moscow in March of 1919. Lenin induced the next party congress to establish the principle of regional and racial autonomy in Russia itself. The ultimate breakdown of the White offensives and peace with Poland now made all the more essential some readjustment of the internal economic disorders. Peasant revolts broke out in the fall of 1920. In March of 1921, Lenin, with characteristic resolution, declared for the New Economic Policy and the abandonment of militant communism in favor of a scheme of national restoration. Despite the famine of 1921-22, this concession to expediency showed immediate favorable results, but the great leader was not to see its fruition. He suffered an attack of sclerosis in May of 1922 and succumbed on Jan. 21,

Whatever one's opinion of Bolshevism as a political and economic school, Vladimir Lenin stands out not only as the most formidable Russian figure, but the most dominating Slav of modern history. An embittered atheist, endowed with no florid brilliancy, a shrewd calculator, obstinately unconscious of his own inconsistencies, master alike of socialist theory as he conceived it, of dialectic, and of the art of mastering men, he commanded an indomitable persistence, an infinite self-discipline and an utterly ruthless and impersonal intolerance in the pursuit of his aims. His will alone raised the Bolshevist faction to the supreme position among Russian revolutionary elements, seized the psychological moments for action, imposed the program and carried his party through perils threatening defeat. He also possessed a subtle flexibility which enabled him to adjust his policy to each crisis. Few men in their lifetimes have grown to greater power, and few in death wield greater influence.

S. H. C.

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LENINGRAD, originally St. Petersburg. The city was called Petrograd in 1914 at the commencement of the Great War, and the name was changed to Leningrad in 1924 after the death of LENIN. After Moscow it is the largest city in Russia, and is under the government of the Union of Socialist Soviet Republics.

Site. Leningrad is located in northwestern Russia at the mouth of the Neva River, at the east end of the Gulf of Finland. Inasmuch as it is now the only Russian port on the Baltic Sea, its economic importance has grown considerably, and this growth is reflected in the statistical tables of the city's rapid industrial expansion. Its situation, on the other hand, generally in the midst of low marshes and lowland, has left the city unprotected from periodical floods. The main part of Leningrad is located on the left bank of the Neva. The arrangement of the streets is radial in character and wide *prospekts* or avenues radiate from the hub of the city. Three important thoroughfares are cut by three waterways; the other streets are arranged practically parallel to those divisions. The principal thoroughfare is the Prospekt of 25th of October, formerly the famous Nevsky Prospekt leading from the heart of the city to the terminal of the railroad from Moscow and Murmansk. Another important railroad leading to Finland has its terminal on the north bank of the Neva. After the 1917 revolution Leningrad was divided into six districts: Central, Moscow-Narva, Volodarsky, Petro-

grad, Vasilievsky Ostrov, and Viborg. The most important bridge is the Okhta, connecting the outlying Viborg district with the rest of the city on the left bank of the Neva. There are also bridges connecting the numerous islands with the city. The ship canal, built in 1875-88, aids materially in trade, and the separate harbors for coal and timber are also important in facilitating commerce. The importance of the Leningrad port in the export and import trade of Russia has increased appreciably as is apparent from the fact that the foreign trade that passed through the port before the World War was 16%, whereas in 1928 the port handled 19.4% of the total foreign trade. Significant also is the fact that whereas in 1921 the freight handled by the port amounted to 429,000 tons, in 1931 this total had increased to 5,500,000 tons.

Climate. Winter in Leningrad lasts from November until April. The river is ice-covered during this period. The importance of the port, however, in the economic life of the country has led to recent attempts to alleviate this condition by deepening the channel; various efforts at ice-breaking have lengthened the term of the seasonal use of the river. The temperature ranges from approximately 15° in January to about 64° in July, the average temperature ranging around 38°. The average yearly rainfall is 18.1 in. The cold, therefore, for the major part of the year combines with the dampness in making the weather unpleasant.

Population. In 1917 there were 2,415,000 inhabitants. But the effects of the revolution were so great that by 1920 this total had been reduced to 722,000. Foreign trade came to an end because of the economic blockade, and the food and fuel shortage as well as the economic depression caused thousands to leave the city. The removal of the political capital to Moscow hastened the process. However, the abolishment of the economic blockade and the introduction of the *nep* policy by Lenin caused a decided revival so that by 1923 the population had increased to 1,067,328. The increase since then has been steadily advancing to 1,614,008 in 1926, and according to the 1931 urban census, increasing to 2,228,300 in 1931.

Imports and Exports. Among the important exports of the city are tallow, grain, timber, hemp, flax, linseed, hides, bristles, fur, copper, caviar, wax and naphtha. Leningrad imports machinery, cotton wool, linen, coal, iron, fruit, tobacco, herring and spices.

Manufactures. Due partly to the electrification program and partly to the general business revival under collectivist control, the economic life of Leningrad has been completely rebuilt. In 1925 the total value of manufactures produced was 700,000,000 rubles; in 1928 this figure had more than doubled. Of this total, 18% consisted of textiles, 10% of clothing and 5% of shoes. Chemical manufactures have also developed rapidly since 1923. But the greatest development has been in metal and machinery manufacture. The great Red Putilov works produce locomotives, steel plates, motors, tractors, engines, turbines, etc., and there are other large enterprises producing steamers, Diesel engines, agricultural implements and electrical equipment. In 1927 there were 485 manufacturing establishments employing 232,502 workers.

Educational Institutions. Leningrad is as rich as always in educational and important scientific institutions. There are 50 higher schools and colleges, 151 scientific institutes, and 102 scientific societies. Among the more important are the Academy of Sciences, Leningrad State University, the University for National Minorities, the Institute of Modern Oriental Languages and the Academy of the History of Material Culture. Others include the Physical Observatory, the Technical Institute, the Institute of Decorative Arts and the Leningrad Communist University in the Uritsky Palace, formerly the Tauride Palace.

Museums and Libraries. The more important museums are the Museum of Art Culture, 1918; the Museum of the Red Army, 1920; the Exhibit of the Supreme Economic Council; the Central Theatrical Museum; the Museum of Comparative Religious Thought, 1922; the Central Geographical Museum; the Museum of Ways of Communication; the Museum of Ceramics; the Museum of the Revolution. The State Public Library, founded in 1814, has 3,000,000 books and many rare manuscripts. Among the more impressive buildings are the Fortress of St. Peter and St. Paul and the Winter Palace.

History. The Neva River outlet had already been in use for ancient trade with the Greeks, but its history began in 1703 when PETER THE GREAT chose the site for the capital of Russia, first because of its proximity to western Europe and second because of its convenience as an outlet to the Baltic. Industrial discontent arose as early as 1749 with a strike among textile workers. The causes that may be assigned for the chronic industrial and political discontent are the city's closeness to western Europe, the violent contrasts between luxury and poverty which were everywhere apparent and the rapid industrialization of the city. Its revolutionary history may be summarized in the Dekabrist Mutiny, 1825; the terrorist acts of the Narodnaya Volya revolutionists, 1870-80; the 1905 revolution near the Winter Palace; the March 1917 Revolution; and the Bolshevik coup d'état of Oct. 1917.

LENOIR, a city and county seat of Caldwell Co. in northwestern North Carolina, situated about 70 mi. northwest of Charlotte. Bus lines and the Carolina and Northwestern railroads serve the city. Corn is the chief crop of the vicinity and furniture is the important local manufacture. Lenoir was founded in 1841 and incorporated in 1851. Pop. 1920, 3,718; 1930, 6,532.

LENÔTRE or LE NÔTRE, ANDRÉ DE (1613-1700), French landscape architect and painter, was born in Paris, Mar. 12, 1613. He early abandoned painting and his first creation as a landscape architect was the garden of the Villa Ludovisi in Rome. Re-

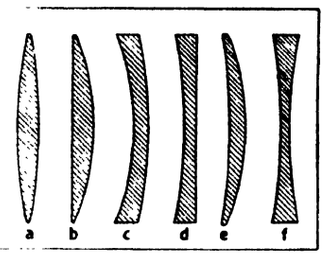
turning to France he designed the gardens of Vaux-le-Vicomte, Meudon, St. Cloud, Chantilly, and above all the great gardens at Versailles and the smaller garden close by at the Trianon. Charles II called him to England where he designed the gardens at Greenwich and at St. James Park, London. He was created a noble in 1675 and died in Paris, Sept. 15, 1700. His work as designer of large formal gardens has probably never been surpassed.

LENROOT, IRVINE LUTHER (1869-), American jurist, was born at Superior, Wis., Jan. 31, 1869. He began practicing law in 1897. He was a Republican member of the state assembly in 1901-07, member of the House of Representatives in 1909-18 and in 1918 was elected to the United States Senate where he remained until 1927. In 1929 he was appointed a judge of the Court of Customs and Patent Appeals.

LENS, an important coal-mining city located in northwestern France, department of Pas-de-Calais. The city was on the battle line during the World War and was occupied by the Germans. It was left in ruins: its mines flooded and machinery destroyed.

LENSES, essentially, curved pieces of glass, quartz, or other such crystalline materials, used to refract rays of light incident from an object to form an image of the object. When a series of lenses are used in a single optical system, the image formed by each lens serves as the object which is imaged by the following lens. Lens theory deals with the metric and photometric relations which exist between object and image and the design of optical systems which shall give imagery of the required character. In general, the image formed by a lens or system of lenses is affected by aberrations which are undesirable but which cannot be entirely eliminated. If the presence of the aberrations is disregarded, a simplified series of relations between object and image is obtained which is useful in the preliminary stages of lens design. In the final design of a lens system, it is necessary to consider the different aberrations and to balance them in such a way that the final image will be satisfactory. If the terms corresponding to the aberrations are included, the equations become very complicated, and, in general, it is necessary to obtain the final lens design by an indirect method in which a design is assumed and modified as the character of its imagery is studied by laborious trigonometric computations in which the paths of typical rays are determined.

Kinds of Lenses. Lenses are broadly classified as *positive,* or converging, and *negative,* or diverging. Thin lenses, are positive if they are thicker at the center than at the edge, and they are negative if thicker at the edge than the center. Lenses are further designated by the character of curvature of the surfaces. Thus, lenses are plano-convex, convexo-plane, double convex, plano-concave, concave-plane, double concave, concavo-convex and convexo-concave; the first of the two adjectives refers to the surface which receives the incident light. The last two types of lenses listed are collectively referred to as *meniscus* lenses. Lenses may also be classified according to the manner in which the aberrations are corrected. Under this classification, lenses may be uncorrected, achromatic, apochromatic, aplanatic, wide angle (corrected for a large field of view), anastigmatic (without astigmatism), distortion-free and the like. Optical systems composed of lenses and MIRRORS are distinguished by the terms dioptric and catoptric respectively.



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CROSS SECTIONS OF LENSES
a, *Double convex.* b, *plano-convex.* c, *diverging concavo-convex.* d, *concavo-plane.* e, *converging concavo-convex.* f, *double concave*

Manufacture. Lenses are commonly made of glass, although for many scientific purposes it is necessary to use crystalline materials, such as quartz, rock salt or fluorite, because these materials transmit the ultra-violet or infra-red light better than the best OPTICAL GLASS. A spherical or a plane surface is the simplest to grind or polish, and, accordingly, surfaces of this character are found on most lenses. Surfaces of revolution, not spherical and termed *aspherical,* however, are occasionally required in order to satisfactorily correct aberrations (*see* ABERRATION IN OPTICAL SYSTEMS). The tool required to produce a convex surface on a lens blank is a circular disc of iron or brass of approximately the same diameter as the lens and with a concave surface of the desired radius of curvature. The surfaces of the lens blank and tool are ground together, the cutting being done by a mixture of granulated carborundum and water which is applied between the two surfaces. As the grinding proceeds, finer grades of carborundum are used, and the grinding of the final surface is completed with fine emery and water. If the lens to be made is of the cheaper quality, the polishing will be accomplished by a tool similar to the grinding tool but faced with cloth coated with a paste of rouge and water. Lenses of better grade are polished with a tool faced with a layer of pitch, approximately one-eighth inch thick, to which the paste of rouge and water is applied. When the lenses are small, say under three inches in diameter, several blanks are mounted on an iron disc and all the lenses ground or polished at the same time by a single large tool. Large TELESCOPE objectives are ground and polished by the same means but the details of handling are necessarily different because of the large size. *See also* PHOTOGRAPHIC OBJECTIVE; DIOPTER; MICROSCOPE; TELESCOPE; OPTICS; MICROSCOPY. I. C. G.

LENT (Old English *lencten,* German *Lenz,* spring), the chief period of fasting in the Christian Church. Fasting was taken over from the Jewish custom by the early Church, as Christ himself had practiced and recommended it and given instructions as to its observance (Matthew 6:16-18). Very soon, however, Wednesday and Friday were substituted for the Jewish days in memory of Christ's betrayal and of

his death. The Roman Catholic Church, however, dropped Wednesday. Besides these days, the specifically Christian custom of Lent arose in early times, at first consisting of 40 hours in memory of Christ's rest in the tomb, based on Matthew 9:15. From this, not later than the 4th century, the long 40 days' fast before Easter developed in connection with Matthew 4:2 (Exodus 34:28; 1 Kings 19:8 in Protestant version, III Kings in Catholic). In the Western Church it begins on ASH WEDNESDAY and culminates in the impressive services of MAUNDY THURSDAY, GOOD FRIDAY and Holy Saturday. In the Greek Church the rules of fasting are still rigorous, but in the Western Church they have greatly relaxed, in that the former fast days became merely days of abstinence from meat, the eating of fish being permitted. In addition, the papacy and episcopate have the right to grant dispensations. Among the religious Orders fasting is stricter, some Orders eating no meat at any time.

LENTIL (*Lens esculenta*), an important food plant of the pea family, believed to be native to southern Europe and western Asia, and cultivated since prehistoric times. The lentil is now extensively grown in the warmer parts of the Old World, the chief commercial crop being produced in Egypt; it is but sparingly planted in the United States. It is a small, much branched annual, 1 to 1½ ft. high, with pinnately divided leaves, inconspicuous, white or bluish flowers and a short broad pod containing two flattened, lens-shaped seeds. The highly nutritious seeds are used chiefly in soups and stews. The lentil was known to the Lake Dwellers of Switzerland and to the ancient Egyptians; it is mentioned several times in the Old Testament and probably formed the red pottage for which Esau sold his birthright.

LENTO, an Italian term used in musical EXPRESSION to indicate a slow tempo, approximately that signified by *adagio*. From the same root is derived *lentando*, meaning slower and slower, hence synonymous with *rallentando*.

LEO, name of 13 popes. St. Leo I, the Great, 440-461, was one of the greatest dogmatic theologians of the Church. His unusual ability and long reign, together with his strong claims for papal authority, resulted in the firm establishment of the papacy as an institution possessing not only a directive, but also a creative, influence on the political development of Europe. St. Leo II, 682-683, confirmed the acts of the Sixth Ecumenical Council. St. Leo III, 795-816, was attacked by a faction and thrown down almost lifeless. He escaped and fled to Charles the Great at Paderborn. The great warrior shed tears as he gathered in his arms the broken body and kissed the bruised face of the Holy Father; and he returned him to Rome with an escort. A year later Charles came to Rome and, as he knelt at the high altar on Christmas Day, the pope placed a crown on his head and the people acclaimed him. Those two figures in St. Peter's give a symbolical picture of the course of history since the Caesars. St. Leo IV, 847-855, saved Rome from the Saracens. Leo V, elected Pope, 903, was deposed a month later and died in prison. Leo VI was Pope, 928-929. Leo VII, 936-939, reformed the monasteries. Leo VIII, 963-965, elevated by Emperor Otto the Great, was driven from Rome in 964 but reinstated by the Emperor. St. Leo IX, 1049-54, was a saint who traveled about reforming the Church ably and valiantly, as well as greatly increasing the prestige of the papacy. Leo X, 1513-21, a Medici, was a great Renaissance pope, soldier, politician and lover of art and science. Leo XI, another Medici, reigned 26 days in April, 1605. Leo XII, 1823-29, joyfully received, became hated for his lack of sympathy with modern political progress. He favored the Jesuits, and put in order the prisons of the Inquisition. He was an able administrator, reformed educational institutions and built many hospitals. LEO XIII, 1878-1903, was one of the greatest of modern popes.

For Leo the Great *see* A. Butler, *Lives of the Saints*, 1844.

LEO XIII, pope, was born Mar. 2, 1810 at Carpineto, near Anagni, Italy, as Gioacchino Vincenzo Raffaele Luigi, sixth son of Count Lodovico Pecci. In his youth he studied rhetoric, theology and both civil and canon law. His first ecclesiastical appointment was as domestic chaplain to Gregory XVI, and in 1838 he was made civil governor of Benevento in the Kingdom of Naples, where he helped to stamp out brigandage. In 1841 he went as delegate to Perugia, doing much to improve the educational and material welfare of the city. He returned to Perugia in 1846 after having been nuncio to Brussels, and was bishop of Perugia for 32 years, until he was elevated to the papacy in 1878. He became one of the first of the great modern popes, and led the opposition to Socialism and Communism, staunchly upheld the doctrine of temporal power, and used his great influence to further the cause of the Catholic Church in all countries, but especially in Great Britain and the United States. Among his numerous encyclicals are *Aeterni Patria, Immortale Dei, Libertas* and *Rerum Novarum*. Under his Pontificate 248 episcopal and archepiscopal sees were created throughout the world. He died at Rome, July 20, 1903.

See W. Barry, *Papacy and Modern Times, 1803–70*, 1911.

LEO (gen. *Leonis*), the lion, the fifth constellation of the Zodiac, visible in the evening sky during late winter and spring. It contains a number of bright stars so arranged as to suggest a long trapezium with a sicklelike curve in front. REGULUS, the heart of the lion, is of the first magnitude, a blue-white star with a faint yellow companion. Beta Leonis, of the second magnitude, is called Denebola, and is in the tail of the lion. Gamma Leonis is a yellow double star with components of the second and third magnitude 3 seconds of arc distant from each other and revolving in a period of 1,000 years or more. In former days the Lion used to be a much larger constellation. Parts of Cancer with the cluster Praesepe formed its head and mouth. Coma Berenices represented its bushy tail, and its feet extended well into what is now Virgo. *See* STARS *map*.

LEO MINOR (gen. *Leonis Minoris*), the little lion, a small constellation of faint stars between Leo and Ursa Major. *See* STAR: *map.*

LEOMINSTER, a city of Worcester Co., northern Massachusetts, situated on the Nashua River, about 40 mi. northwest of Boston. It is served by the New Haven Railroad. Covering an area of about 26 sq. mi., Leominster is devoted chiefly to manufacturing. Besides combs, its chief product, the city manufactures celluloid, paper, pianos, chairs, buttons, shirts, jewelry, baby carriages and toys. Its products were valued in 1929 at $23,557,516. In 1929 the retail business amounted to $7,519,488. Leominster was originally part of Lancaster. It was incorporated as a town in 1740, and as a city in 1915. Pop. 1920, 19,744; 1930, 21,810.

LEON, MOSES BEN SHEM-TOB DE (c. 1250-1305), better known as Moses de Leon, mystic and Kabbalistic writer, was born at Leon, Spain, about 1250. Of a restless nature and gifted with a fluent pen, Moses de Leon traveled extensively and wrote a great deal on religious subjects and on the KABBALAH. But of all his writings, only one of his works was published. In 1287 he wrote the *Sefer ha-Rimmon,* or *The Book of the Pomegranates,* which he dedicated to the Kabbalist Levi Abulafia. In 1290 he wrote *Nefesh ha-Hakhma,* or *Soul of Wisdom,* which was published at Basel in 1608. In 1292 he wrote *Shekel ha-kodesh,* or *The Sacred Shekel,* and in 1293 he wrote *Sefer Hasodes,* or *The Book of Mysteries.* De Leon died at Arvelo in 1305.

It is not his writings that made De Leon's name so prominent after his death, but rather the much disputed authorship of the *Sefer ha-Zohar,* or *Zohar, The Book of Splendor,* the greatest of all the works on the esoteric doctrine of the Hebrews, the Kabbalah, which was at that time in great vogue among the Jews, particularly in Spain. Some, basing their opinion upon information supposed to have come from De Leon's widow and daughter, attribute to him the authorship of this work; others are of the opinion that he brought this manuscript from Palestine and that he merely edited it. Still others think that he had nothing to do either with the writing or with the editing of this book. The controversy is not settled as yet, and the literature on it is large enough to fill a fair sized library. I. S.

See Graetz, *Geschichte der Juden,* Vol. VII, p. 199.

LEON, a city of Mexico, situated in a fertile valley in the state of Guanajuato, at an elevation of 6,200 ft. above sea level, about 259 mi. north of Mexico City. It trades in cereals and other grains produced in the surrounding country and its outstanding industries are the manufacture of saddles and other leather goods, straw hats, scarfs or *rebozas,* worn by most of the native women, woolen and cotton goods and gold and silver embroideries. It has a good street railway system, electric lights, public schools and a market, where native goods, fruits and vegetables are sold. In one of the main plazas there is an artesian well. The municipal palace is the most important building in the city. The cathedral, built on the site of one of the many primitive churches in the country, was begun in 1746, and finished in 1765.

In 1888 a devastating flood swept over the city, destroying about 2,000 homes, and drowning more than 200 of the inhabitants. To prevent a repetition of such a disaster, the city has built enormous dykes along the river bank. Leon was settled in 1576 and incorporated in 1836. Pop. 1921, 53,639; 1930, 85,153.

LEON, a city of Nicaragua, 32 mi. southeast of its port, Corinto, and lying about equidistant from the Pacific and Lake Managua. The city lies on the great plain of the same name, about midway between Managua and Fonseca bay, on the old historic route to Honduras. It is connected by rail with Corinto, which is the outlet for the coffee and other produce of the surrounding plantations. The old cobbled streets, flanked by thick-walled patio houses, display many shabby churches, their fronts peeling and their furnishings visibly poor. The cathedral fronts one side of the plaza. The cemetery, with its long path of blue and white tiles and its flower-decked monuments and shady trees, is in marked contrast to the neglected public park of the city.

In the neighborhood of Leon is the ancient Indian city of Subtiaba, whose inhabitants were said to number 100,000 in pre-Columbian times. It was the capital of the powerful Nagraudan nation, a branch of the Chorotegans, who were dominant in the region between Lake Managua and the sea. Est. pop. 1929, 50,000.

LEÓN, an ancient kingdom in northwestern Spain. Alfonso the Great, King of Asturias, in 910 granted to his eldest son, Garcia, the lands toward the south newly conquered from the Moors. Garcia developed this state, and moved the capital to León. Eventually the name came to include the whole of Christian northwest Spain. Castile broke away from León in the 10th century. War between the two resulted, both appealing to the Moors for aid. Castile and León were finally united in 1230.

LEÓN, a city in Spain, capital of the province of León. The Torio and Bernesga rivers meet near the city. León is surrounded by walls and towers of Roman times and has many churches, among them the splendid 13th and 14th century Gothic cathedral, a Romanesque church dating from 1005, the abbey Church of St. Mark, a Gothic city hall, palaces and a bull ring. The city derives its name from the Legio Septima Gemina, whose headquarters it was. León has been Christian since the 10th century and was in Moorish hands only from 996, when it was captured by Sultan Almansor, until his death in 1002. At one time it was the capital of the old kingdom of León. The city produces sugar and machines and trades in linen, cattle, horses and grain. Est. pop. 1929, 23,000.

LEONARD, WILLIAM ELLERY (1876-), American scholar and writer, was born at Plainfield, N.J., Jan. 25, 1876. He studied at Boston, at Harvard and Columbia universities, and in Germany.



"THE LAST SUPPER"

By Leonardo da Vinci (1452-1519), painted upon a wall in the monastery of Santa Maria delle Grazie at Milan, Italy.

In 1904-06, he served as associate editor of *Lippincott's English Dictionary*. In 1906 he joined the faculty of the University of Wisconsin, as instructor in English, and became a full professor in 1926. Leonard published translations of *Lucretius* and *Beowulf*, and many original writings, including *The Scansion of Middle English Alliterative Verse, La Metrica del Cid, Two Lives* and *The Locomotive God*.

LEONARDO DA VINCI (1452-1519). Leonardo da Vinci was the most intellectual of all artists. No one of whom we have record combined so many great gifts in one person. As an artist he occupies a supreme place, for he must always be ranked in any list of the world's six greatest artists, and as a scientist he was quite as exalted. Indeed there are not lacking those who claim that Leonardo had the greatest of all brains, for in science he worked alone, far ahead of his contemporaries and his findings in these lines are respected even in this age of science. He was a military engineer and an expert in hydraulics and architecture and his talents were constantly employed by the several rulers whom he served. As if all this were not enough, he seems to have had a radiant personality and was universally beloved. In his youth he was regarded as an exceptional being and in his old age he was looked upon with reverential awe. Altogether he was the ideal artist of the Italian Renaissance and his career is without parallel for its successes.

He was the son of a Florentine lawyer, born out of wedlock by a mother of humble station in the hill-town of Vinci. The father acknowledged him and brought him up in his own house and saw to his education. Andrea del Verrocchio was a friend to the father and hence was chosen as master when the boy's interest in the arts became noticeable. The young man learned his profession quickly and the story goes that Verrocchio recognized him to be his superior when Da Vinci painted an angel into the master's picture of *Christ's Baptism*, now in the Academy at Florence. Leonardo was shortly after taken into favor by Lorenzo the Magnificent and the brilliant career was thus launched.

In 1487 he was invited to Milan by Ludovico, probably as much for his engineering as for his art, but it was there, in the midst of manifold occupations, that he produced one of the world's greatest paintings, the famous *Last Supper*. This work, so renowned for its masterly composition and its extraordinary knowledge of the human heart as shown in the depiction of one of the most moving dramas in Christ's history, is still as potent as ever it was, in spite of the fact that now it is but a ghost of its original self. It suffered at the outset from imperfect conditions on the wall on which it was painted and then vandals in the wars mistreated it and worse than all, inefficient "restorers" did it great damage. But in spite of all this it is still probably the best known painting in the world of art.

As might be expected, a man so variously occupied as was Leonardo did not leave behind him many such masterpieces. Next in fame to the *Last Supper* is the *Gioconda* of the Louvre, a portrait of Mona Lisa on which the artist is said to have labored for 4 successive years, causing music to be played during the settings that the rapt, smiling expression should not fade from the lady's countenance. This work, for which Francis I paid 4,000 gold florins, was once stolen from the Louvre and the whole world was agitated by the theft and gratified by its recapture from the thieves. In the Louvre also are the *Virgin of the Rocks* and the *Virgin and St. Anne*, both very famous. In Leonardo's lifetime the greatest excitement was produced by a cartoon he made of a battle-scene, in a contest with Michelangelo. When the two rival cartoons were shown in Florence it was thought that they were the two wonders of the world, but unfortunately both have been destroyed. The drawings by Leonardo now in Windsor Castle, England, are also among the sure foundations of his great fame. Leonardo died in 1519 in France, at Amboise, where he lived in the service of Francois I who greatly admired him. H. McB.

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LEONCAVALLO, RUGGIERO (1858-1919), Italian music composer, was born at Naples, Mar. 8, 1858. Educated in the Naples Conservatory, he composed his first opera *Tommaso Chatterton* at the age of 18. Inspired by WAGNER, he conceived a trilogy, based on the Italian Renaissance, *Crepusculum* (I. *I Medici*, II. *Girolamo Savonarola*, III. *Cesare Borgia*). The first of these proved a failure when produced in 1893, and although he continued to compose operas none had any notable success except *Pagliacci* which, after its première in 1892, took the world by storm. Unlike most composers he wrote the libretti for the majority of his works which included, besides those cited, *La Bohème* (eclipsed by Puccini's work of the same title), *Zaza, Gli Zingari, Ave Maria*, and *Giofredo Mameli*. He died at Montecatini, Aug. 9, 1919.

LEON DE MODENA (1571-1648), famous Italian rabbi, scholar and poet, was born in Venice, Apr. 23, 1571. A foe of the Cabala, Modena was the first rabbi of the Renaissance to advocate reforms in Jewish religious life. He was a prolific author of religious and poetic works which gained him international repute among Jews and non-Jews alike, including high church officials and members of Royal houses. One of his poems, "Kinah Shemor," consisting of words which make sense both as Italian and Hebrew words, is quoted in several literatures as the most brilliant poetical composition. Modena is best known in the Christian world by his book *Riti Ebraici*, which he wrote for King James of England, giving an impartial description of the Jewish religious ceremonies. He died in Venice, Mar. 21, 1648. S. B.

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LEONIA, a borough of Bergen Co., N.J., located on the east branch of the Hackensack River 2 mi. west of the New Jersey terminus of the George Washington Memorial Bridge and 11 mi. north of Jersey City, N.J. It is served by the Erie Railroad system of New Jersey, trolleys, motor bus lines with direct connections to the New York ferries, and the New York subway system via the George Washington Memorial Bridge. It is strictly a suburban residential community. Pop. 1920, 2,979; 1930, 5,350.

LEONIDAS, King (c. 489-480 B.C.), of Sparta. Commanded the Greek army of approximately 7,000 men sent to defend the pass of THERMOPYLAE, connecting Thessaly with Boeotia and Attica, against the army of XERXES. He withstood the Persian frontal attack but when the Persians, crossing the mountains by another pass, threatened his rear, Leonidas ordered the bulk of his army to withdraw. He covered their retreat with the help of a small and devoted band of Spartans. These men by their heroic stand and death won for themselves and Leonidas, who perished with them, undying glory.

LEONIDS, a shower of METEORS occurring in November of each year, and so named because they appear to be radiating from a point in the constellation LEO.

LEON PINELO, ANTONIO DE (? -1660), Spanish author and historian, born in Peru toward the end of the 16th century. He made several voyages of exploration in America, among them a trip up the La Plata River. In preparation for the writing of his history of the New World, he visited the libraries of Mexico and Peru, and, finding these insufficient went to Spain, where he utilized the documents in Madrid and the Simancas Archives. His numerous writings on the history of the New World have been a valuable contribution to research. Among his most important works are *Epitome de la Biblioteca Oriental y Occidental, Nautica y Geografia* (1629); *Historia Natural de las Indias occidentales* (1631); and *Gobierno espiritual eclesiastico de las Indias.*

LEONTINI, Lentini, a town of eastern Sicily, 5 mi. from the sea and northwest of Syracuse, was founded by Chalcidians from the island of Naxos in 730 B.C. It fell under Hippocrates in 498 B.C. and under Syracuse later in the same century. The Saracens took it in 848 A.D. The earthquake of 1698 left little of the ancient city.

LEOPARD, a large spotted cat of the family *Felidæ,* specifically *Felis pardus;* sometimes called PANTHER. Leopards now are rare except in Africa south of the Sahara and in India, but a variety, the snow-leopard, or OUNCE, inhabits the central Asian mountains, and another, the clouded leopard, belongs to the Malayan region and Borneo. A typical leopard measures 5 to 8 ft. in length including the long tail, has a slender, agile form and a sleek, tawny skin, thickly marked with black spots and rings except on the white throat and ventral surface. In the varieties mentioned the spotting is much diffused; and a totally black variety is common in the East.

This princely cat is far lighter, more active and cunning than either lion or tiger, an agile climber of rocks and trees, more numerous and thus more destructive. It is quick to anger, and very dangerous when aroused or at bay. Besides preying on wild game and birds, it is a greatly feared pest by owners of cattle, goats, sheep or dogs, and occasionally turns man-eater, with disastrous results to villagers and campers. It is probable that much of the killing of live stock and human beings, charged to the lion in Africa or the tiger in India, is the work of sly and murderous leopards, which seize and carry off their victims with astonishing boldness, strength and skill. Leopards breed well in menageries, and become mild and docile when gently treated. E. I.

LEOPARDI, GIACOMO, COUNT (1798-1837), Italian lyric poet, was born at Recanati, in the Apennines, June 29, 1798. He was permitted to pursue the studious life to which his physical deformities, as well as his genius, inclined him. His classical studies, researches and translations, made him at an unusually early age one of the most learned scholars in Italy. Unhappy in his home, he went to Rome in 1822, thereafter wandering from city to city, leading a miserable and poverty-stricken life until he settled in Naples in 1833. CARDUCCI separates Leopardi's poems into two periods. The first period comprises those poems written up to 1826, as his collection, *Versi,* during which time his philosophical pessimism and his mastery of technique were developing. The second period includes those poems written after 1826, when both his philosophy of despair and his mastery of form had fully matured. Leopardi died in Naples, suffering and despondent, June 14, 1837. *See also* ITALIAN LITERATURE.

LEOPARD MOTH, a species (*Zeuzera pyrina*) of the family of carpenter moths (*Cossidæ*), white in color and beautifully marked with numerous small black spots. It was accidentally introduced into the eastern states from Europe. Young larvæ bore in the small twigs of the host plants, later migrating to the branches and trunks. Here they live for about two years. In eastern cities near the sea coast they are a serious pest.

LEOPOLD I (1790-1865), King of the Belgians, son of the Duke of Saxe-Coburg and uncle of Queen Victoria of England, was born at Coburg, Germany, Dec. 18, 1790. He entered the service first of Emperor Alexander of Russia and then of Napoleon, finally marrying Princess Charlotte, only daughter of King George IV of England. His wife died in 1817 but he continued to live in England until 1831 when he was elected king of the Belgians. He weathered the difficult revolutionary period of 1848 with skill and wisdom and continued to rule Belgium conservatively and peacefully until his death at Laeken near Brussels on Dec. 10, 1865.

LEOPOLD II (1835-1909), King of the Belgians, son of King LEOPOLD I of Belgium, was born at Brussels Apr. 9, 1835. He succeeded his father on the throne, Dec. 10, 1865. The event most commonly

associated with his rule is the founding of the Congo Free State in Africa. Leopold is said to have obtained an immense fortune from the exploitation of this region, and the ruthlessness with which he treated the natives subjected him to scathing criticism. He died at Laeken near Brussels Dec. 17, 1909.

LEPANTO, BATTLE OF, an engagement on Oct. 7, 1571, between the fleet of the Christian League under Don John of Austria and the combined Turkish Aegean fleet. The Christian League, made up of Venice, Spain, the Papal States and Genoa and formed by Pope Pius VI, set sail to stop the encroachments of the Moslems in Greece and in other Aegean lands. The equal forces met in the gulf of Lepanto, where the Turks had drawn up their battle lines. When the League's ships broke through the center, despite the Turks' success on the wings, the Turkish fleet became demoralized, thus giving the League the victory. In following up their advantage, the allies captured or sunk more than half of the Turkish ships. The significance of the battle lies in the fact that it broke the Turkish control in the Mediterranean. Lepanto was the last important engagement in which the combatants used oar-propelled vessels. The casualties were very severe, the Turks losing more than 20,000 men and the Christians 8,000. More than 15,000 Christians whom the Turks had enslaved in their galleys were freed.

LEPIDODENDRON, an extinct genus of magnificent evergreen trees of Carboniferous time whose living relatives are club-mosses (Lycopods) like the lowly ground-pine. A trunk in the United States National Museum rises 30 ft. without tapering, indicating a full growing height of perhaps 135 ft. The young, pendulous branches were thickly felted with needlelike leaves and tipped with slender cones sometimes 20 in. long, which bore large sausage-shaped spores. The hundred or more species are distinguished largely by the pattern of diagonally disposed scars left on the stem by the falling leaves. The horizontally spreading roots of this tree are indistinguishable from those of the related SIGILLARIA. They constitute the peculiar sprawling fossils called STIGMARIA.

LEPIDOPTERA, an order of insects, whose members are known popularly as butterflies and moths. They are distinguished by their usually large and often very beautiful wings, of which there are two pairs. The wings of each side operate as one; either a lobe of the hind-wing causes them to overlap, or they are fastened together by a sort of catch. Microscopic scales typically cover both body and wings. Lepidoptera feed on flower and fruit juices. Their mouths are generally equipped with long sucking tubes, which they carry coiled like watch-springs. The larvæ are caterpillars. Moths usually pass the pupa stage in cocoons, while butterflies commonly become exposed chrysalids.

LEPONTINE, an extinct INDO-EUROPEAN language preserved in numerous short inscriptions from the vicinity of Lake Como in northwestern Italy. Like VENETIC, and perhaps SICULIAN, it apparently belonged to the LIGURIAN group.

LEPROSY, a chronic infectious disease of man caused by the *Bacillus leprae.* Leprosy is undoubtedly transmitted by contact, but its degree of contagion is very low. Years may pass after infection before the disease manifests itself.

There are two types of leprosy. The *nodular form* is the more common, except in the tropics. Associated with an intense fever, red areas develop on the face. The fever subsides after some days, but the local areas of redness enlarge, multiply, and become thickened and hard. The process continues until the face or other parts of the body are quite covered with thick, confluent tubercles. A characteristic leonine expression is developed.

The *anesthetic form* is found chiefly in the tropics. The local areas are small and flat, but many bacteria grow in connection with the nerve trunks. As a result, large areas become anesthetic and groups of muscles become paralyzed.

There is no certain cure for leprosy, but chaulmoogra oil has shown valuable results. Radiology has had good effects in local lesions. Segregation is imperative.

LEPSIUS, KARL RICHARD (1810-84), German Egyptologist and philologist, was born at Naumburg-am-Saale, Dec. 23, 1810. From 1842 to 1845 he headed an Egyptian expedition sponsored by the king of Prussia. In 1846 he was appointed professor of Egyptology in the Berlin University. On an Egyptian expedition in 1866 Lepsius made his famous discovery of the table of Canopus with inscriptions in hieroglyphic, demotic and Greek. His *Denkmäer aus Aegypten und Aethiopien* is a 12-volume masterpiece on the expedition of 1842-45. Among his other works is a translation of the *Book of the Dead* and treatises on Etruscan, Chinese, Arabic, Assyrian and Egyptian philology. He died in Berlin, July 10, 1884.

LEPUS (gen. *Leporis*), the hare, a small but striking constellation directly south of Orion, contains a number of stars of the third and fourth magnitude. Noteworthy are Gamma Leporis, a double star with a period of several thousand years at a distance of 23 light years, and R Leporis, a variable star, often called the blood-drop because of its deep red color. *See* STAR: *map.*

LERDO DE TEJADA, SEBASTIAN (1825-89), Mexican political leader, was born in Jalapa, Mex., Apr. 25, 1825, and educated for the law. He entered politics as a supporter of Juárez whom he served as minister of foreign affairs, and succeeded as President of Mexico in 1872. In this office he endeavored to establish a strong central Government to perpetuate his power, but in 1876 was driven out by JOSÉ DE LA CRUZ PORFIRIO DIAZ. He died in New York in 1889.

LÉRIDA, a city of Spain, capital of the province of Lérida. It is built in a fruitful plain on the slope of a hill. The city has old walls, a citadel and forts, a Roman bridge across the Segre River, a palace used by the Aragon kings, a former late-Ro-

manesque cathedral begun in 1203 with Gothic and Moorish additions, a new cathedral built from 1761 to 1781, a theological seminary, and an institute, which was once a university. Lérida is the seat of a governor and of a bishop. There is considerable industry, chiefly in glass, leather, paper, silk, wool and cotton goods, and trade in grain, oil and lumber. Est. pop. 1929, 38,000.

LERMA, a river in the southwestern part of Mexico, rising in the state of Mexico at the foot of the Toluca volcano. It flows generally westward into Lake Chapala, issues therefrom through a deep barrance on the north bank, and continues as the Rio Grande de Santiago in a northwesterly course to the Pacific Ocean. Its total length is about 540 mi. About 15 mi. above Guadalajara its waters are precipitated over the magnificent falls of Juanacatlan. The swift current of the stream above the lake prevents navigation but in some sections of its lower reaches barges and river steamers can be used.

LERMONTOV, MIKHAIL YUREVICH (1814-41), Russian poet and novelist, was born in Moscow in 1814. Under the influence of Byronism, he produced *Lyrical Poems,* 1828-41, filled with doubts, rebellion and volcanic outbursts; *The Demon,* 1829-41, a Satanic poem occupying the major portion of his creative life, and *Song of Tsar Ivan Vasilyevich,* 1832, an epic poem or heroic folk tale of revolt against the authority of the czar. Lermontov is the most tragic of Russian poets and akin to the Italian GIACOMO LEOPARDI. He is the apostle of individualism, and Russian intellectuals learned from him the lesson of spiritual rebellion. Lermontov died, following a duel in the Caucasus, July 15, 1841.

LEROY-BEAULIEU, PIERRE PAUL (1843-1916), French economist, was born at Saumur, Dec. 9, 1843. After completing his education at Paris, Bonn, and Berlin universities, he wrote for Paris perodicals, and in 1861 published his first book, *La Question monnaie au dix-neuvième siècle.* In 1872 he was appointed professor of finance at the École Libre des Sciences Politiques, becoming professor of political economy at the Collège de France in 1880 and continuing important literary production. In 1873 he founded the *Économiste Française.* He died at Paris, Dec. 10, 1916.

LESAGE, ALAIN RENÉ (1668-1747), French writer, was born at Sarzeau, May 8, 1668. Deserting the law for literature, he turned his attention to the translation of Spanish novels and plays. He met with no great success until 1707, in which year *Le Diable Boiteux,* a satirical novel, was published. The same year saw also the success of his comedy, *Crispin rival de son maître.* It is, however, as the author of GIL BLAS, that Lesage is most famous. He died at Boulogne-sur-Mer, Nov. 17, 1747.

LESBOS, the ancient name for the modern Mitilene, an island off the west coast of Asia Minor. Mountains, good harbors, and fertile soil covered with olive groves characterize the island. Pop. 1928, 161,557. The chief city is MITILENE.

LESCHETIZKY, THEODOR (1830-1915), Polish pianist, was born at Lancut, June 22, 1830. He studied with CZERNY at Vienna, and at the age of 14, although in the midst of strenuous general education, began giving music-lessons. Both he and Rubinstein were so impressed by the playing of Chopin's protegé, Schulhoff, that they completely revolutionized their technique, abandoning the Thalberg method. In 1852 he went to St. Petersburg to teach in the Conservatoire. He returned to Vienna in 1878, and established his famous school. His pupils included Essipoff, Paderewski, Zeisler and Gabrilówitsch. He died at Dresden, Nov. 14, 1915.

LESCOT, PIERRE (1510-78), French architect, was born in Paris in 1510. Lescot was one of the chief founders of the Renaissance style in France, undertaking, as his first great work, the building of the Louvre, the older parts of the west and south wings of the present building being his design. One of his little masterpieces is the Fountain of the Innocents. He became a pensioner of Henry II, and lived comfortably upon his holdings of the abbacy of Clermont and a canonship of Notre Dame. He died in Paris, Sept. 10, 1578.

LES EYZIES-DE-TAYAC, a village located on the Vezère River near its confluence with the Dordogne in south central France. The town is famous as the center of most important studies of the life and art of the early Stone Age, as the neighborhood abounds in the caves of prehistoric peoples. The Cro-Magnon Man was discovered at Les Eyzies in 1868. The famous caves of Font de Gaume, Cap Blanc, and Les Combarelles with their Paleolithic drawings and sculpture are within a few miles and the prehistoric stations of Le Moustier and La Madeleine, whose excavations gave their names to Stone Age periods, are in this vicinity. Pop. 1931, 994.

LESKOVAC. *See* LESKOVATS.

LESKOVATS, also known as Leskovac, a town of YUGOSLAVIA, situated in the southeast corner of old Serbia, about 30 mi. from Vranya. It is surrounded by a broad plain in which grows excellent flax and hemp. There is considerable trade in these products and tobacco. Leskovats was under the rule of Turkey until 1877, when the Serbs captured it and the Congress of Berlin the following year incorporated it in the Serbian Kingdom. Pop. 1931, 17,615.

LESLIE, THOMAS CLIFFE (1827-82), British economist, was born in County Wexford, Ireland, in 1827. In 1853 he was appointed professor of political economy and jurisprudence at Queens College, Belfast. Leslie was one of the founders of the historical school of political economy. He wrote *Land Systems and Industrial Economy of Ireland, England and the Continental Countries.* He died at Belfast, Jan. 27, 1882.

LES MISÉRABLES, a vast panoramic romance of French life in the early 19th century, by VICTOR HUGO; published 1862. It is a profound indictment of the evils of the police system. The hero of this superb work is a noble-hearted peasant, Jean Valjean, who is

transformed into a hardened criminal when he is condemned to the galleys for his theft of a loaf of bread. Freed from the galleys, the embittered Jean is reformed by the unexpected kindness of Bishop Myriel, and becomes a respected citizen and eventually the mayor of his town. At the height of good fortune, however, his old enemy, Javert, prefect of police, suddenly appears and again imprisons the hero. He escapes, but dies soon after in tragic circumstances. Three minor characters of importance are Fantine, a young woman whom Jean rescues; Cosette, her daughter; and Marius, who is in love with Cosette. Among the most memorable of the many magnificent scenes are those which take place in the underground sewers of Paris and in the Battle of Waterloo.

LESPEDEZA, a large genus of herbs and subshrubs of the pea family, numerous species of which are commonly called bush clover. There are about 45 species, found in North America, Asia and Australia. Of these a few Asiatic species are grown as ornamentals and one, *L. striata,* known as Japan clover or lespedeza, has recently been introduced into the southern states as a forage plant. *See also* JAPAN CLOVER.

LESPINASSE, JEANNE JULIE ELEONORE DE (1732-76), French writer and social leader, was born at Lyons, Nov. 9, 1732. She was the illegitimate daughter of the Comtesse d'Albon and later became governess to the daughters of Madame de Vichy, her mother's legitimate daughter. While holding this position she met MADAME DU DEFFAND, the sister of Madame de Vichy. She was the companion to this lady in Paris for 10 years, leaving in 1764 as a result of Madame du Deffand's jealousy of her social success. Opening a salon of her own with the aid of sympathetic friends, Mademoiselle de Lespinasse became one of the most popular hostesses in Paris, notwithstanding that she possessed neither money nor beauty. Her *Letters,* 1809, have been the subject of wide interest. She died in Paris, May 23, 1776.

LESSEPS, FERDINAND, VICOMTE DE (1805-94), French engineer and diplomat, born at Versailles, Nov. 19, 1805. From 1849 to 1854 he was in the diplomatic service, and in the latter year obtained from Said Pasha, Viceroy of Egypt, a concession to build a canal across the Isthmus of Suez. In spite of the opposition of Great Britain acting through Turkey and great engineering and financial difficulties, Lesseps completed the canal in 1869. In 1879 he undertook the management of a French company to build a canal at Panama. The difficulties were greater than had been foreseen and there was much financial irregularity in the management. In 1890 the company was put into bankruptcy and Lesseps convicted of misappropriation, probably technical only, and sentenced to five years' imprisonment. The sentence was never carried out. (*See* PANAMA SCANDAL.) Lesseps died at La Chenaie, Dec. 7, 1894.

LESSING, GOTTHOLD EPHRAIM (1729-81), German dramatist and critic, was born at Kamenz, Saxony, Jan. 22, 1729. At the University of Leipzig he studied theology, philology and philosophy, maintained his intense interest in the classics, and commenced his dramatic writing. After brilliant work as a literary critic in Berlin, 1751-54, he issued his collected works in six volumes, in 1755, and produced *Miss Sara Sampson,* 1755, a tragedy of lowly life that marked a turning-point in German literature. Within the next decade he produced a series of letters containing critical essays of a high order that established the philosophical theory of criticism on a firm basis. Lessing continued this work in his masterpiece, *Laocoön,* 1756, and in his drama, *Minna von Barnhelm,* 1767. The *Hamburgische Dramaturgie,* 1767-68, containing a wealth of material on matters dramatic and theatrical, was decisive in turning the literary currents in the direction of Shakespearian influences. *Emilia Galotto,* a tragedy that appeared in 1772, was received with enthusiasm. A scarcely less favorable reception was accorded the mature work of his old age, *Nathan der Weise,* 1779, containing an extended apologia on behalf of religious toleration. Lessing died at Brunswick, Feb. 15, 1781.

LETCHWORTH PARK, a state park located near Portage and Genesee Falls in Wyoming and Livingston counties, western New York. The park was established in 1907 and comprises 1,600 acres of scenic country. Letchworth Park contains the famous Portage Falls, a graceful cataract descending into a gorge from 250 to 300 ft. in depth.

LETHAL GAS. *See* CAPITAL PUNISHMENT.

LETHBRIDGE, a city of Alberta, Canada, situated at an altitude of 2,982 ft., on the Belly River, 145 mi. southeast of Calgary. An extensive irrigation project in the region makes possible large crops of alfalfa and grain. Lethbridge also is the commercial and distributing center of a great bituminous mining section, and has foundries, flour mills, and stone and wood-working factories. It is the seat of a Dominion Experimental Station for Agriculture established in 1906. A government terminal elevator was established in 1931. Pop. 1921, 11,097; 1931, 13,489.

LETHBRIDGE VIADUCT, a steel viaduct across Old Man River and valley, near Lethbridge, Alberta, Canada, occurring on the Crow's Nest branch of the Canadian Pacific Railway. The structure is 5,317 ft. in length, and has a maximum height of 307 ft. The double-track roadway rests on 44 plate-girder spans, 99 ft. long, and one-deck lattice span measuring 167 ft. in length. The spans are supported by 33 rigidly braced steel towers which stand on concrete pedestals.

LETHE, in Greek mythology, a river of the lower world. When the dead drank of its waters they forgot the past.

"LETHEON." *See* MORTON, WILLIAM THOMAS GREEN.

LETO, in Greek mythology, the mother of APOLLO and ARTEMIS, the same as the Roman LATONA.

LETTER OF CREDIT, an instrument by which a BANK, for account of a customer, gives formal evi-

dence of its willingness to permit a designated person to draw on certain terms, and stipulates in legal form that such bills will be honored. Where the purpose is to supply a traveler with funds, the instrument utilized is a travelers' letter of credit, which is a circular letter to the correspondents of the issuing bank designated in an accompanying letter of indication, informing them that the beneficiary is authorized to draw SIGHT DRAFTS up to a certain specified total amount. The correspondent identifies the beneficiary by requiring him to duplicate his signature appearing in the letter of indication and writes off the amount of the draft negotiated in a space provided in the credit instrument.

Where the purpose is to finance the movement of merchandise, the customer for whose account the instrument is issued is normally the buyer, and the beneficiary, the seller, and the instrument is designated a commercial letter of credit. The draft will customarily be accompanied by shipping documents evidencing the dispatch of the merchandise and controlling its disposition on arrival. Commercial letters of credit are classified, according to the method of transmission, as circular or specially advised; according to duration, as revocable or irrevocable; according to obligation, as unconfirmed or confirmed; according to method of payment, as negotiable or straight; according to method of reimbursement, as simple or reimbursement; and according to provision for renewal, as revolving credits, cumulative or noncumulative. W. W.

LETTER OF MARQUE AND REPRISAL, a commission or license issued by a government to a private person to fit out a privateer, an armed vessel, to cruise at sea and make prize of an enemy's ship and cargoes. The first commissions of this kind were issued about the middle of the 13th century during the reign of Edward I of England, and vessels carrying such commissions, called also letters of marque, have taken a prominent part in succeeding wars between the maritime nations as late as the early part of the 19th century. The possession of such a letter kept the holders from being considered pirates or corsairs.

LETTISH or **LATVIAN,** an important member of the BALTIC linguistic family, spoken by about 1,500,000 people in Latvia and on the Kurische Nehrung. It is divided into a large number of dialects which fall into the three main groups of Tahmian, Middle and High Lettish, the literary language being based on a Middle Lettish dialect. Lettish appears distinctly modern as compared with LITHUANIAN, most of its phonology and morphology being traceable to older forms found in Lithuanian to-day, though the present Lettish phonetic system had already been developed by about 1200 A.D.

The earliest literary document in Lettish is a catechism published in 1585. The best known modern writers are Rainis and Aspazija, whose works have been translated into other languages. The collections of folk-songs, published by Baron and Wissendorf, and popular tales, by Lerchis-Puschkaitis, are of great value for linguistic and cultural investigations. A. SE.

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LETTRES, BELLES. *See* BELLES-LETTRES.

LETTRES DE CACHET, letters or orders emanating from the king of France in the days of the old régime, signed by him and customarily countersigned by a secretary of state, which were used for a variety of purposes, the most famous of which were the forcing a parliament to register a law in spite of its objections, and the sentencing of subjects without trial or opportunity of defense to imprisonment or transportation.

LETTUCE (*Lactuca sativa*), a smooth annual of the composite family extensively cultivated for its crisp tender root leaves used as a salad. The plant, which has been grown since Greek and Roman times, is believed to be a cultigen evolved by gardening from the prickly lettuce (*L. Scariola*), native to the Mediterranean region and widespread as a weed. Centuries of cultivation have resulted in the development of numerous varieties. Among these are the curled lettuce (var. *crispa*), with a loose rosette of crisped leaves; the head lettuce (var. *capitata*), with the leaves in a dense roundish head; romaine or cos lettuce (var. *longifolia*) with long narrow leaves in a loose elongated head, and asparagus lettuce (var. *asparagina*), grown for its thick edible stem.

LETTUCE, COMMERCIAL PRODUCTION, U.S., 4-Year Average, 1927-30

Division	*Acreage*	*Production (Crates)*	*% of Tot. Prod.*
UNITED STATES	139,115	19,436,000	100.0
LEADING STATES:			
California	86,977	11,731,000	60.4
Arizona	25,376	3,193,000	16.4
New York	5,312	1,425,000	7.3
Colorado	10,460	1,118,000	5.8
Florida	1,797	367,000	1.9

In the United States lettuce is the most extensively used green salad and is grown and marketed on a large scale. With the development of irrigation, lettuce for winter and early spring consumption is produced in immense quantities in California, especially in the Imperial Valley, and in Arizona. In 1929 California and Arizona produced more than three-fourths of the commercial crop marketed in the United States.

LEU, the monetary unit of Rumania, equivalent at par, to .6 cent.

LEUCITE, a rare rock-forming mineral found in certain volcanic rocks or LAVAS. It is gray to white, with a dull greasy appearance. It belongs to the feldspathoid group, so called because they correspond to the FELDSPARS, but contain less silica. Leucite is a potassium aluminium silicate, crystallizing in the ISOMETRIC SYSTEM. It is found abundantly and well crystallized only in the basaltic lavas of Vesuvius, although other and older occurrences are known in Germany and western United States. *See also* ORTHOCLASE; NEPHELITE; BASALT; PETROLOGY.

LEUCTRA, BATTLE OF (371 B.C.), an engagement fought between the Thebans and Spartans and their allies near Leuctra, a village in Boeotia. It marked an advance in military strategy because the oblique order was used for the first time by Epaminondas, the Boeotian general. The Peloponnesian army numbered about 10,000 while the Boeotians had only 6,000 men. Contrary to the usual custom of placing the best soldiers on the right in a 12-deep column, Epaminondas made a 50-deep column of infantry on the left which advanced first. The Spartan army was disorganized and 2,000 were killed, including King Cleombrotus. Alexander the Great and Frederick the Great afterward used this strategy with outstanding success.

LEUKEMIA, a disease which is characterized by a tremendous proliferation of the white cells and which goes more or less rapidly to a fatal termination. *See* LYMPHATIC SYSTEM, DISEASES OF.

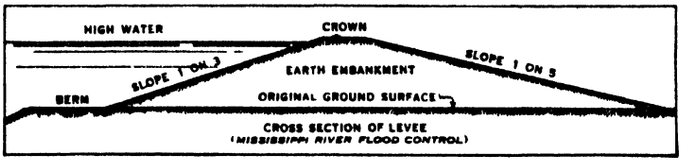
LEUTZE, EMANUEL (1816-1868), American painter, was born at Gmünde, Würtemberg, Germany, May 24, 1816, and was brought to America in childhood. He studied in Philadelphia under John A. Smith, under Lessing at Düsseldorf where he later did much painting, and in Munich, Venice and Rome. He devoted himself to historical painting, particularly in relation to the discovery and history of America. His famous *Washington Crossing the Delaware,* painted in 1850, is in the Kunsthalle at Berlin, and a replica is in the Metropolitan Museum, New York, where also hangs *Worthington Whittredge,* a portrait. After frequent visits to America, Leutze came to stay in 1863, and died in Washington, D.C., July 18, 1868.

LEVA, the monetary unit of Bulgaria, equivalent at par, to .72 cent.

LEVANT, a word derived from the Latin *levare,* to raise, and applied since medieval times in Europe to the East, the land of the rising sun. Specifically it refers to the lands of the eastern Mediterranean, Asia Minor, Syria, Egypt, etc., with which areas western Europe carried on a growing and important commerce from the time of the crusades down to the 16th century, when the new overseas traffic gradually reduced the significance of this eastern trade, though in England the Levant Company founded in 1581 did considerable business for many years, and in France the Levant trade was important until the 18th century.

LEVAU, LOUIS (1612-70), French architect, who rose to prominence in his profession with the design and construction of the château of Vaux-le-Vicomte in 1643. Shortly after this achievement he became one of the court architects of Louis XIV and in 1665 was commissioned to build the two pavilions of Versailles, and to superintend the rearrangement and partial reconstruction of the Tuileries and the Louvre. He died at Paris, Oct. 11, 1670.

LEVEES, banks of earth built parallel to the channels of water courses to confine the water within the channel when floods occur. On large streams levees are built with a minimum top width of six feet and with sides having a drop of one foot to three feet on the horizontal. When levees are of considerable height and are subjected to floods of long duration it is customary to enlarge the section on the land side. Where



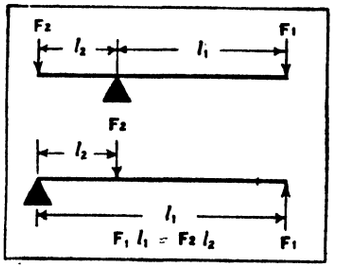
LEVEE

floods are of short duration a levee with smaller cross section is often permissible. Levees should always be planted in grass to prevent washing.

Structures along or near a sea or other open body of water are also called levees, although these are generally referred to as DIKES. Levees are constructed by various excavating and filling equipment such as SCRAPERS, DRAGLINE EXCAVATORS, trucks, railway cars or hydraulic equipment (*see* DREDGES). The cross-section varies with the maximum flood heights, with other conditions and with the nature of the soil, and slopes are protected to prevent erosion. *See also* FLOOD CONTROL; REVETMENT; EROSION; EXCAVATING MACHINERY.

LEVELING, or the determination of differences in elevation, may be carried on by three methods: 1. Direct spirit leveling, the engineer's level being used to establish a true horizontal line and a graduated rod to measure the height of the instrument above the point where the rod is held; 2. Leveling by vertical angles, in which the distance is found by triangulation (*see* SURVEYING) or by stadia (*see* TACHEOMETRY), the vertical angle measured with the TRANSIT or THEODOLITE and the height calculated. 3. By means of a BAROMETER, the difference in height of two stations being derived from the measured difference in atmospheric pressure.

LEVER, in mechanics, a device for multiplying an applied force. It consists of a body, usually a bar or beam, pivoted on a fulcrum at one point. There are two types, one in which the fulcrum is between the applied force and the resisting force and one in which it is beyond both of the forces. A pump handle is an example of the former and a nut cracker of the latter. The "mechanical advantage" of the level is l_1/l_2 (see Figure), where l_1 and l_2 represent the distance from the fulcrum to the applied force, F_1, and to the resisting force, F_2, respectively. In equilibrium, $F_1 l_1 = F_2 l_2$.



TYPES OF LEVERS

LEVERHULME, WILLIAM HESKETH LEVER, 1st Viscount (1851-1925), British industrialist, was born at Bolton, Lancashire, Sept. 19, 1851. He began his career in his father's wholesale warehouse, and in 1884, leased a small soap-factory which

he developed into a world-famous industry through advertising. His success was due, in part, to the fact that his employee benefit plans (pensions, profit-sharing, life insurance, scholarships, and similar features which were the subject of wide controversy) kept him clear of labor troubles. In 1888 he established Port Sunlight, a model industrial village near Bebington, Cheshire, one of the first large-scale examples of industrial welfare work. In 1906, Lever entered parliament as a Liberal. He was made a baronet in 1911, raised to the peerage in 1917, and given a viscounty in 1922. He died at Hampstead, England, May 7, 1925.

LEVERRIER, URBAIN JEAN JOSEPH (1811-1877), French astronomer, was born at Saint Lô, Mar. 11, 1811. Originally a chemist, he turned to astronomy, accepting a post as teacher of astronomy at the École Polytechnique in 1837. He set to work to investigate P. S. Laplace's figures on the motions of the planets and calculated the irregularities of their orbits with great exactness. Perturbations of the orbit of Uranus lead him to conclude the existence of an outer planet. He calculated its probable position and from these figures J. G. GALLE at Berlin discovered the planet Neptune on Sept. 23, 1846, within one degree of the calculated position. From 1854 to 1870 and again in 1872 Leverrier was director of the Paris Observatory. He recalculated the motions of all the major planets, his tables appearing in the *Annales de l'Observatoire de Paris.* He died at Paris, Sept. 23, 1877.

LEVI, according to the traditions of the early ancestors of the Hebrews preserved in the BOOK OF GENESIS, was the son of JACOB and Leah and a brother of Dinah, whose escapade with Shechem led to the terrible massacre described in Genesis 34. The popular etymology of his name (Genesis 29:34) is sometimes put aside by modern scholars in favor of that given later (Numbers 18:2 and 4) as meaning "they who joined themselves" either to Aaron or to the Israelites when they first migrated into Canaan. Those who accept the legendary view say, "If Levi is original it may be best regarded as the gentilic of Leah, if ethnic, may be adduced as a parallel." The Bible regards him as the ancestor of the Levites, whose males between 25 and 50 years of age assisted the priests in the services of the tabernacle and the temple. Among the Jews later, they became the learned class from which the scribes and judges were chosen. Their three great family divisions, the Gershonites, Kohathites and Merarites were allowed no territorial possessions, except 35 cities in which they lived supported by tithes from the other tribes.

LEVIGATION, the operation of grinding solid material to a very fine powder in the presence of a liquid. The fine particles are usually removed from the grinder by a stream of liquid. The ordinary mortar and pestle, when used to grind a solid material in a liquid is an example of small scale levigation. In industrial practice, levigation is carried out on a large scale in fields such as metallurgy, and paint and pigment manufacture. Any of the many types of equipment that have been developed for fine grinding can be used in levigation, provided they can be used for wet operation. W. L. McC.

LEVIRATE, a custom found in many primitive societies, by which, when a man dies, his widow becomes the wife of his next younger brother. This is sometimes obligatory, sometimes optional. In a few places a group of brothers may combine to pay the bride price and to marry one woman or several sisters. These various forms of marriage with a husband's brother, all known as the levirate, are practiced in so many regions that anthropologists have found it easier to count the instances of their absence than those of their presence.

LÉVIS, a town of Lévis Co., Quebec, Canada, situated above the southern bank of the St. Lawrence opposite Quebec with which it is connected by bridge and ferry. An important transatlantic and river shipping port, Lévis particularly shares in Quebec's large lumber trade. Shipbuilding and the Lorne dock and a Dominion Government 1,150-ft. graving dock accommodations also are of importance. Lévis has a number of industries, among them foundries, a planing mill, sawmill, and saw, boiler-making, household goods and broom plants. A French-Canadian city, its history is bound up with Quebec's. Wolfe's batteries, an old fort and earthworks lie above it, and Lévis proper contains many conspicuously fine buildings, both new and old. Pop. 1921, 10,470; 1931, 11,724.

LEVITA, ELIJAH (1469-1549) (known also as Elijah Bahur and Elijah Tishbi; his real name was Elijah ben Asher Halevi), Hebrew grammarian, commentator and author, was born in Neustadt on the Eysh, Germany, in 1469, and died at Venice in 1549. He is generally considered to have been the principal teacher of the Christian Hebraists, and the founder of the study of the Hebrew language and literature by Christians, a movement which began with Johann Reuchlin at the beginning of the 16th century. Levita numbered among his students many Catholic priests and Protestant clergymen, for example, George de Selve, bishop of Lavour, and taught for years at Rome, Padua and Venice. While at Rome he resided for 10 years at the home of Cardinal Ægidio de Viterbo, whom he assisted in his Cabalistic and grammatical studies.

Some of Levita's important grammatical works were *Sefer Habahur,* 1525, treating of the Hebrew noun and verb; *Massoreth Hamassoreth,* 1538, in which he first declared that vowel signs and accent marks are not found in the Talmud, a view in opposition to the traditional belief that they had been revealed to Israel on Mt. Sinai, or had at least been introduced by Ezra in the 5th century B.C.; *Tishbi,* 1529, containing philological studies. All his grammatical works were translated into Latin by Sebastian Münster. In addition, he wrote commentaries on Moses Kimhi's Hebrew grammar, and made a German translation of the Pentateuch, the propheti-

cal portions of the Bible, and the Five Scrolls: Song of Songs, Ruth, Lamentations, Ecclesiastes and Esther, for practical and popular use. A. SH.

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LEVITATION, the rising of a person or object in the air, thus defying the law of gravity. The belief in such power appears in connection with the miracles of saints such as St. Joseph of Cupertino. It was a feat claimed by spirit mediums, notably D. D. Home. There are also accounts of such performances on the part of Indian magicians. The phenomenon is not accredited and depends for the widespread belief in its possibility on the testimony of inaccurate witnesses.

Levitation also applies to the alleged lifting of a table completely from the floor without aid from the hands or feet of the medium or sitters. There is no authentic account of either performance under conditions excluding fraud or self-deception. The appearance of floating is produced on the modern stage by ingenious devices.

LEVITES, the descendants of Levi, the son of the Biblical patriarch Jacob. They were the Temple servants, the members of the ancient Hebrew tribe of Levi, and were assigned the exclusive prerogative and task of assisting the PRIESTS in their Temple duties. (Numbers 3:5-10; 4:1-33.) For this reason they received no landed inheritance when the territory of Canaan was divided up among the other tribes in the days of Joshua. According to Numbers 3:11-13; 3:40-51, the Levites were dedicated to the service of God by reason of the fact that God had relinquished his claim to possession of all the male first-born of Israel. The Levites, as well as the priests, were supported by the tithes and offerings of the people. However, the idea that the whole tribe of Levi had been thus set apart for Temple service appears to have been a later one, representing an unhistorical development. For in ancient days the priest was called Levite (Judges 17:7; Exodus 4:14), and in this early period of Israelite history the Levites appear to have been similar to the other tribes of Israel, engaging, like the other 11 tribes, in warfare and other secular pursuits. (Genesis 34:25-31; 49:5-7.)

Originally no definite distinction was made between priests and Levites. All the priests and Levites who served at the various sanctuaries were of equal rank. But after the destruction of the second temple certain early prerogatives of the priests and the Levites were traditionally reclaimed in the synagogue.

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LEVITICUS, BOOK OF, deriving its title from the Latin version of the Bible, sets forth the functions of the Levites, who, though mentioned by name only incidentally, performed the sacerdotal or priestly work of the Hebrews. It deals almost exclusively with legislation regarding the ritual of sacrifice, the definitions and causes of uncleanliness, the ceremonies for the day of atonement, and contains miscellaneous regulations pertaining to tithes and vows. According to the chronology of the Pentateuch, of which it is the third book, its events cover a period of one month. Most modern scholars regard the book as the work of priest-authors during the 9th to the 7th century B.C. Its 27 chapters, however, have played an influential part in the formal expression of Judaism, and must be considered with the prophetic part in estimating that religion.

LEVULOSE, a sugar, sometimes termed fructose, is probably the most abundantly occurring of the keto-hexose sugars. Each molecule of SUCROSE contains one molecule of FRUCTOSE along with one of GLUCOSE. INULIN, on conversion, yields fructose in the same way as STARCH yields glucose and this constitutes one of the most important sources of the sugar. The most common source of inulin is the Jerusalem artichoke and dahlia tubers.

LEWES, GEORGE HENRY (1817-78), English author, was born in London, Apr. 18, 1817. After appearing on the stage, he turned to literature and contributed to the press many articles on the drama. In 1855 he published the *Life of Goethe,* perhaps his chief work. He also wrote a life of Robespierre. His last work, *Problems of Life and Mind,* sum up his outlook and philosophy. In 1851 Lewes met GEORGE ELIOT, the novelist; unhappily married and unable to obtain a divorce, he formed a union with her. It was largely owing to Lewes's persistent persuasion that George Eliot was induced to take up novel writing. Lewes died in London, Nov. 28, 1878.

LEWES, a municipal borough and the county town of Sussex, England, lying in the South Downs on the Ouse, 50 mi. south of London. Archaeological finds indicate the prehistoric origin of this town of steep streets and ancient houses. On a rise are the ruins of a castle traditionally founded by Alfred and rebuilt after the Conquest. Tom Paine, author of *The Rights of Man,* once lived at Lewes. An important port in the 11th century, to-day it manufactures agricultural implements, and has foundries, breweries and market gardens. Pop. 1921, 10,797; 1931, 10,785.

LEWIS, ISAAC NEWTON (1858-1931), American army officer and inventor of the Lewis machine gun, was born Oct. 12, 1858, at New Salem, Pa. He was graduated from the United States Military Academy in 1884 and was commissioned artillery officer. He served on the Coast Artillery board for New York harbor, from 1894 to 1898, when he was transferred to the Ordnance department at Washington. In connection with this, Lewis went abroad to study the methods of foreign armaments, and to his recommendations, in 1900, were due changes in the armament of the nation's field artillery. He was responsible for many innovations, including his artillery range and position-finder, replotting system for coast batteries, and a quick-firing gun. He retired from the service, as colonel, in 1913, when his machine-gun invention was patented and sold to the British, French, and Belgian governments, after it

was rejected by the U.S. Army. It was used by the Allies throughout the World War, but upon entry of the United States in 1917, it was adopted by this country. He declined to accept royalties due him for its use by the United States. He died at Hoboken, N.J., Nov. 9, 1931.

LEWIS, MATTHEW GREGORY (1775-1818), English romance-writer, also known as "Monk" Lewis, was born in London, July 9, 1775, and educated for a diplomatic career at Westminster School and Christ Church, Oxford. In 1794 he became attaché to the British Embassy at The Hague, and in 1795 wrote *Ambrosio, or The Monk,* after which he was nicknamed "Monk" Lewis. From 1796-1802, he was a Member of Parliament. The latter part of his life was spent in the West Indies. His other works include a musical drama, *The Castle Spectre,* 1796; *The Minister, Rolla* and *The Bravo of Venice,* translations; and *Journal of a West Indian Proprietor,* published posthumously in 1833. Lewis died of yellow fever, May 14, 1818, on a return voyage from Jamaica.

LEWIS, MERIWETHER (1774-1809), American soldier and explorer, was born near Charlottesville, Va., Aug. 18, 1774. In 1794 he enlisted in the expedition to quell the WHISKEY INSURRECTION in western Pennsylvania, and in 1797 enlisted in the regular army. In 1801 he was Jefferson's private secretary. In 1803 he was appointed commander of the first overland journey through the United States to the Pacific, the Lewis and Clark Expedition. The party passed the first winter at St. Louis, ascended the Missouri River, spent the second winter near the present city of Bismarck, and reached the mouth of the Columbia River on Nov. 15, 1805, having traveled 4,000 miles. In 1807, having returned to Washington, he was appointed Governor of Louisiana Territory. The circumstances of his death, near Nashville, Tenn., on Oct. 8, 1809, have never been satisfactorily established.

LEWIS, SINCLAIR (1885-), American novelist, was born at Sauk Center, Minn., Feb. 7, 1885. After graduating at Yale University, in 1907, he worked for several years on newspapers, magazines, and in publishing houses. His first novel to attract general attention was *Main Street,* 1920, which aroused much controversy over its portrayal of middle western life. It was followed by *Babbitt, Arrowsmith, Elmer Gantry,* and *Dodsworth.* Lewis was awarded the Nobel Prize in Literature in 1930. He has been a merciless satirist, each of his important novels taking up some outstanding feature of American life and lampooning it vigorously. He caricatures his people freely and is chiefly interested in making his satire of life and character caustic and effective. But his character creations are typical of the more vulnerable features of the period and are distinctive and vital. Although Lewis's writing is sometimes slipshod and verbose, his influence on American fiction has been undeniably great.

LEWIS, WILLIAM MATHER (1878-), American educator, was born in Howell, Mich., Mar. 24, 1878. He graduated in 1900 from Lake Forest College, where he taught from 1903-06. Lewis was headmaster of Lake Forest Academy from 1906-13; director of the savings division, United States Treasury Department, 1919-21, and chief of education service, United States Chamber of Commerce, from 1921-23. In 1923 Lewis became president of George Washington University, resigning in 1927 to become president of Lafayette College.

LEWIS, WYNDHAM (1886-), English author and critic, was born in 1886. An outstanding figure in modern English art and letters, he wrote fiction, philosophy, drama and essays, and attracted attention by his futuristic paintings and designs. He founded and edited *The Enemy,* a review of art and literature, published in London. Among Lewis's works are *The Art of Being Ruled, Harold Gilman, An Appreciation,* in collaboration with Louis F. Ferguson; *The Ideal Giant,* a drama; *The Lion and the Fox; Tarr; Time and the Western Man;* and *The Wild Body.*

LEWIS AND CLARK CAVERN, a national monument in southwestern Montana, situated about 45 mi. northeast of Butte. The monument was created by presidential proclamation on May 11, 1908 and its present extent of 160 acres was established May 16, 1911. The cave was discovered in 1895. Its entrance is about 1,300 ft. above the Jefferson River and overlooks the trail followed by Lewis and Clark along that river for a distance of over 50 mi. The maximum length of the cave is 600 ft. and its depth 400 ft. The cave is of limestone with tortuous passages and chambers beautifully decorated with stalactites, stalagmites and all manner of fantastic drip formations. The transcontinental highway known as the Yellowstone Trail passes within 5 mi. of the cave near Cardwell, Mont. and it is but 14 mi. from Whitehall on the Northern Pacific Railroad. A poor road leads up Cave Mountain to a point within 45 minutes walking distance from the entrance. The cave, however, has been closed to the public for several years, awaiting funds for a lighting system and ranger protection.

LEWIS AND CLARK EXPEDITION, 1804-06, the first exploration of Louisiana Territory by an American party, suggested by President Jefferson, subsidized by Congress, and led by Meriwether Lewis and William Clark. The expedition set out from St. Louis May 14, 1804, ascending the Missouri. The country to the Mandan villages near the Great Bend of the Missouri had been made known by Spanish explorations; beyond was unknown. Wintering at a Mandan camp 1,600 miles from St. Louis, the expedition, now numbering about 30 exclusive of Indian guides, resumed its westward march Apr. 7, 1805, and on July 25 reached the three forks of the Missouri River. Proceeding up the Jefferson, the party crossed the Rockies, descended the Columbia, and on Nov. 15 came in sight of the Pacific Ocean. After wintering on the coast, the expedition began its return journey Mar. 23, 1806, and arrived in St. Louis Sept. 23, with

a mass of unique data, meteorological, geographical, ethnological, botanical and zoological. The journals of Lewis, Clark and other members of the expedition have been published verbatim.

LEWIS GUN, a light machine gun developed by Colonel Isaac N. Lewis in 1914 and used extensively by the Allied armies in the World War. Its automatic action is obtained from the pressure of powder gas released from the bore operating against a piston, which in turn operates the breech mechanism. Its drum-shaped feeding box was its distinguished characteristic.

LEWIS INSTITUTE, a privately controlled, nonsectarian college for men and women at Chicago, Ill., was incorporated in 1895, as a result of bequests from the estates of John and Allen C. Lewis. The institution maintains courses in science, literature and technology, and in the latter department provides laboratories for physics, chemistry, biology, home economics, and steam, mechanical and electrical engineering. It had productive funds in 1931 amounting to $1,390,078. The library contained 30,000 volumes. In 1930 there was an enrollment of 1,825 in day courses, and 1,878 in evening courses, and a faculty of 111 headed by Director George N. Carman.

LEWISOHN, ADOLPH (1849-), American mining engineer and philanthropist, was born at Hamburg, Germany, May 27, 1849, and came to America at an early age. Becoming interested in various mining ventures throughout the country, he eventually rose to be president of mining corporations and head of the investment firm of Adolph Lewisohn & Co. Lewisohn has made numerous benefactions, which include the Columbia University School of Mines Building, New York City, and the Lewisohn Stadium of the College of the City of New York. He has been president of the Hebrew Sheltering Guardian Society and chairman of the Prison Survey Commission of New York State.

LEWISOHN, LUDWIG (1882-), American author, was born in Berlin, Germany, May 30, 1882, of Jewish descent, and was brought to the United States when 8 years old. He was educated at Columbia University and in 1911-19 taught German at Ohio State University. Thereafter he engaged in editing and writing, and in 1922 published *Upstream,* an autobiographical work containing a penetrating analysis of American culture. He translated the dramatic works of GERHART HAUPTMANN, 1912-24, and wrote *The Island Within, The Last Days of Shylock,* 1931, and other works.

LEWISTON, a city on the western boundary of Idaho, the county seat of Nez Percé Co., situated at the head of navigation on the Snake River, in the lowlands, 90 mi. south of Spokane, Wash. Rivercraft and three railroads serve the city. Lewiston is a trade center for a region engaged in farming, lumbering, gold, silver and lead mining. It is the seat of the Lewiston State Normal School. Lewis and Clark camped here in 1805 and 1806. The discovery of placer gold in the Clearwater region brought permanent settlers in 1861, and the town was incorporated in 1862. Pop. 1920, 6,574; 1930, 9,403.

LEWISTON, a city in Androscoggin Co., southwestern Maine, situated on the Androscoggin River opposite Auburn, about 36 mi. northeast of Portland. It is served by the Grand Trunk and the Maine Central railroads, and is connected by bridge with Auburn. The surrounding country is hilly and picturesque, and the lakes and ponds are stocked with salmon and trout. The Maine Fish Hatchery is 3 mi. distant. Within the city limits the Androscoggin River drops 108 ft., forming three beautiful falls. Hydro-electric dams increase the water supply thus obtained. The chief local manufactures are textiles, shoes and shirts. The factory output, 1929, was worth $21,069,612. The retail business in 1929 amounted to $20,843,277. Valuable mines of feldspar, acquamarine, tourmaline, beryl and garnets are found near by. The city is the seat of Bates College, with a registration of about 800 students. Lewiston was founded in 1770 by Massachusetts settlers, prominent among whom was Paul Hildreth. It was incorporated in 1795 and chartered as a city in 1863. Pop. 1920, 31,791; 1930, 34,948.

LEWISTOWN, a city in central Montana, the county seat of Fergus Co., situated 100 mi. southeast of Great Falls, and nearly surrounded by the Snowy, the Judith, the Belt and the Moccasin mountains. Two railroads afford transportation. Lewistown lies in a wheat-growing region, once a buffalo range, and later a stock ranching country. The city has oil refineries, brick yards and flour mills, and is in the center of unusual mining activities, producing coal, gold, silver, sapphires and gypsum. There are oil fields in the vicinity. Lewistown was settled in 1898 and incorporated in 1899. Pop. 1920, 6,120; 1930, 5,358.

LEWISTOWN, a borough and county seat of Mifflin Co., Pennsylvania, located 60 mi. northwest of Harrisburg on the Juniata river; served by the Pennsylvania Railroad, motor buses and airline. It is beautifully situated in an agricultural, dairying and industrial region; manufactures, chiefly iron, steel and rayon, are valued at about $35,000,000. The retail trade in 1929 amounted to $9,719,202. One of Pennsylvania's earliest iron centers, Lewistown was founded in 1754 by Robert Buchannon, named for William Lewis, and became a borough in 1795. Caves and peculiar rock formations are found here; likewise, Fort Granville's site, which saw an Indian massacre in 1756. General Frank R. McCoy was a resident. Pop. 1920, 9,849; 1930, 13,357; 2% foreign-born; 5% colored.

LEXINGTON, a city of central Kentucky, the county seat of Fayette Co., situated in the "blue-grass" region about 82 mi. south of Cincinnati. The Southern, the Chesapeake and Ohio and the Louisville and Nashville railroads, bus lines and an airport serve the city. There are highly-developed stock farms in the vicinity, where famous race horses have been bred. Lexington holds a foremost position as a tobacco market. Among the manufactures are tobacco, flour,

food products, advertising novelties, furniture, drugs and building materials. In 1929 the industrial output reached a total of about $8,000,000. The retail business amounted to $38,208,060, in 1929; automobiles afforded the largest sales. The University of Kentucky, Transylvania University, Sayre and Hamilton College are located here. Robert Patterson and a hunting party founded the town in 1775, naming it for the initial battle of the Revolution. Lexington received a city charter in 1832. Pop. 1920, 41,534;

LEXINGTON, a town including the historic village of Lexington, in Middlesex Co., northeastern Massachusetts. The village is situated about 11 mi. northwest of Boston and is served by the Boston and Maine Railroad. The town has farms and a few factories, but the village is essentially residential. The village green was the scene of the Battle of Lexington, the first important engagement of the American Revolution, April 19, 1775. The boulder marking the stand of the minute-men when the British attacked them, and the monument, erected in 1799, are the landmarks of chief interest. Paul Revere, John Hancock and Samuel Adams met together at the Hancock-Clarke house, partly built in 1698, and now a historical museum. Buckman and Monroe taverns still stand. The site of Lexington, first a part of Cambridge, was settled in 1642. Pop. 1920, 6,350; 1930, 9,467.

LEXINGTON, a city and county seat of Davidson Co., in central North Carolina, situated about 20 mi. south of Winston-Salem. An airport, bus lines and two railroads serve the city. Lexington is a trade market for the rich agricultural region, raising chiefly cotton, tobacco, wheat, and truck garden produce. Textiles, furniture, and hosiery are the principal manufactures. The Daniel Boone Memorial Cabin and Trading Ford where General NATHANIEL GREENE escaped Cornwallis during the Revolution are landmarks of the city. Lexington was founded in 1823 and incorporated in 1827. Pop. 1920, 5,254; 1930, 9,652.

LEXINGTON, a town in western Virginia, the county seat of Rockbridge Co., situated on the Maury River, 53 mi. northeast of Roanoke. It is served by bus lines and two railroads. Lexington is the seat of Washington and Lee University and the Virginia Military Institute. The university was founded as an academy in 1749, and named for Washington in appreciation of his donation in 1798. It was made a college in 1813. ROBERT E. LEE was its president from the end of the Civil War until his death and he is buried in the Lee Memorial Chapel. In 1871 the college became a university and the name of Lee was added. From 1851 to 1861 Stonewall Jackson taught at the Virginia Military Institute, founded in 1839, and he is buried in Lexington. Sam Houston was born near here. The celebrated natural bridge is 15 mi. southwest. The region produces grain and dairy products. The town was founded and incorporated in 1778. Pop. 1920, 2,870; 1930, 3,752.

LEXINGTON, BATTLE OF, Apr. 19, 1775, the first conflict of the REVOLUTIONARY WAR. At the order of Gen. Gage, commanding the British army at Boston, Lieut.-Col. Smith with 800 men was despatched, Apr. 18, to arrest Samuel Adams and John Hancock, who were in Lexington, and to seize a quantity of military supplies gathered by the Rebels at Concord. The movement became known, and Paul Revere and William Dawes were despatched to give the alarm to the villages along the line of march. Revere reached Lexington about midnight. When at dawn Maj. Pitcairn with several companies of infantry, in advance of the main body under Smith, entered the village, his way was disputed by a company of about 70 MINUTE MEN under Capt. Parker. Pitcairn commanded the Rebels to lay down their arms and disperse. Whether, after his command, a British soldier or a Rebel fired the first shot, is unknown. In the short exchange of fire eight of the Americans were mortally shot and 10 wounded; the remainder retired, and the British marched to Concord. *See* CONCORD, BATTLE OF.

LEYDEN or **LEIDEN,** a city in the Dutch province of South Holland, located on the Old Rhine. An ancient city, Leyden has 17 churches, among them St. Peter's, built in 1315, and St. Pancras' of the 15th century. Among the other buildings is the city hall, built in the 16th century. The city, once famous for its cloth, is now Holland's chief market for woolen goods, camlet, serge and flannel. Apart from the numerous cloth factories, tape, yarn, blankets, leather and soap are manufactured. Trade in butter and cheese also thrives. The university was established in the late 16th century by William of Orange and has a large library with many manuscripts and various museum collections. Academically important, Leyden has besides the university many schools and museums. Several of the famous Dutch painters were born or lived there at some time, as Rembrandt, Dou, Mieris and Lucas of Leyden. In 1574 Leyden was besieged by the Spaniards. In the 17th century its cloth industry flourished greatly. Pop. 1930, 70,811.

LEYDEN, SIEGE OF, 1574, one of the most dramatic events in the revolt of the Netherlands. After the besieging Spanish army became so strongly entrenched that military relief to the town was impossible, William of Orange had the dykes cut, saying that it was better to ruin the land than lose it. Slowly the water spread over the fields. The sea-beggars were finally able to succor the half-famished inhabitants, while the besiegers fled to avoid drowning. In order to reward the citizens for their heroic resistance, William founded the University of Leyden which soon became one of the most distinguished in Europe.

LEYDEN JAR, a form of an electric CONDENSER consisting of a glass jar with the lower half and the bottom covered, both inside and outside, with tinfoil. A rod passing through the cover makes electric contact with the inner tinfoil. The jar is discharged by connecting the inner and the outer coat-

ings. The CAPACITANCE of an ordinary Leyden Jar is about 0.002 microfarads (*see* FARAD), and, when charged to a difference in potential of 60,000 volts, its electric charge has a potential energy of 3.6 joules. Two Leyden Jars in a series are generally used to increase the capacitance of the collectors in ELECTROSTATIC MACHINES. A. Z.

LHASA, the religious and political capital of Tibet situated on the Kichu, a tributary of the Brahmaptura, at an elevation of over 11,000 ft. above the sea. Lhasa is the residence of the Dalai Lama, the supreme head of the Lamaist church, and has been called "the Rome of Buddhism." The city contains many monasteries and a cathedral. The palace of the Dalai Lama, an immense building, stands on a rocky hill above the plain and presents one of the world's most imposing sights. Entrance into the city of Lhasa was denied to Christians though throughout the 19th century Russian and English travelers managed to gain admission. Since 1904 when the British forced an entrance, Lhasa has been visited by numerous foreigners. Though its chief interests are religious there is considerable trade in silks, velvets, carpets, porcelain, tea and musk. In the vicinity are many important monasteries which are visited annually by thousands of pilgrims. Pop. between 15,000 and 20,000.

LIABILITY, LIMITED. *See* LIMITED LIABILITY.

LIAISON, connection or communication established between various officers or between units and officers on the field of battle or the march, and, in a peculiar sense, between the infantry and its supporting arms. Liaison officers are a distinct feature of high command. Their purpose is to promote a common understanding among higher commanders and between higher and lower units.

LIAONING, the name given in 1928 to the Manchurian province formerly called Fengtien.

LIAOTUNG PENINSULA, the peninsula extending from South Manchuria into the Gulf of Peichihli. The northwestern shore line is fairly smooth, but the rest is bordered by many islands and has many indentations. The peninsula itself is a rocky extension of the mountains on the east of Manchuria, and contains comparatively little arable land. The KWANTUNG LEASED TERRITORY is located at the southern tip of the peninsula.

LIBAU. *See* LIEPAJA.

LIBEL. *See* DEFAMATION.

LIBERAL, a city in southwestern Kansas, county seat of Seward Co., situated 80 mi. southwest of Dodge City. The Chicago, Rock Island and Pacific Railroad and the Kansas and Oklahoma Railroad afford transportation. The district raises chiefly wheat, broom corn and livestock and, for these products, Liberal is a shipping center. Pop. 1920, 3,613; 1930, 5,294.

LIBERALISM, in English politics a term first applied to that body of political and economic thought represented by JOHN STUART MILL in the field of theory and by GLADSTONE in the realm of politics. Toward the end of the century a new liberalism seemed to develop, interested chiefly in decentralization. Its support of the movement for Home Rule in Ireland illustrates the new program. More recently still, liberal writers such as Professor Hobhouse and J. H. Hobson show considerable evidences of Fabian or socialist influence. The old individualistic point of view of Mill and Gladstone seems to have been definitely shed by modern liberalism. In America the term has been used synonymously in recent years with progressivism.

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LIBERAL PARTY. *See* CONSERVATIVE.

LIBERAL REPUBLICAN PARTY, a political party in the United States which participated in the presidential election of 1872. First prominent in Missouri in 1870, when B. Gratz Brown was elected governor by a fusion of Liberal Republicans and Democrats, the party was organized nationally in a convention meeting at Cincinnati May 1, 1872. Carl Schurz, E. L. Godkin, Charles Francis Adams, Whitelaw Reid, Lyman Trumbull, David Davis, Charles Sumner, Horace White and Chauncey M. Depew were prominent in the deliberations, which concluded with the nomination of Horace Greeley for president and Brown for vice-president, upon a platform calling for thorough reform of the civil service ("honesty, capacity, and fidelity should constitute the only valid claims to public employment"); the reestablishment of civil government throughout the South and the removal of all southern political disabilities; speedy resumption of specie payments; no further land-grants to railroads; and the ineligibility of a president of the United States to reelection. The party was committed, in intent, to "anything to beat Grant," as a protest against corruption in the National Government, and to political reform in general. Its appeal as the party of reform was vitiated however, by the silence of the platform in respect to tariff reform, in deference to Greeley's high-tariff views. As a means of combining all opposition to the Republican administration the Democratic party formally accepted the candidates and platform of the Liberal Republicans. The rank and file were not united in support of the candidates. A dissenting element, taking the name STRAIGHT DEMOCRATS, nominated a separate ticket. After a vitriolic campaign in which both Grant and Greeley received unlimited personal abuse, the Liberal Republican-Democratic ticket was overwhelmingly defeated; Greeley received 2,834,079 popular votes against Grant's 3,297,070, and 47 electoral votes against Grant's 286.

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LIBERAL-UNIONISTS. *See* THIRD PARTIES.

LIBEREC (*Reichenberg*), the leading textile center of North Bohemia, situated on the Neisse River, Czechoslovakia. Liberec has four churches, a synagogue, a castle of the Count Clam-Gallas with a

fine chapel, 1604, a new city hall and other modern buildings, including an important museum and picture galleries with fine modern paintings. The industrial suburbs participate largely in the production of cloth making which was introduced at the end of the 16th century. Important textile fairs have been held annually since 1920. For a short time in 1918, the city was the seat of the German-Bohemian government. Pop. 1930, 38,525.

LIBERIA, a Negro republic on the Atlantic coast of Africa and one of the three independent states of that continent. Most of its borderline lies along the French colony of the Ivory Coast on the north and east; the British colony of Sierra Leone stretches on the west. It has a coast line of 350 mi. and extends inland from 100 to 170 mi., covering a territory of 43,000 sq. mi. The coast line is straight with hardly any indentations, and the surface is mostly an extended plateau averaging in height about 1,500 ft. Large tracts of the area are covered with luxuriant forests, where 22 species of trees are found. Several rivers traverse the region, the largest being St. Paul's, Mano and Kavalli. The soil of Liberia is productive but agriculture as well as other industries are barely started. The staple product is indigenous coffee. Para rubber plantations are being developed by American interests, and rice, palm oil and kernels, pola nuts, beni and anatto seeds, beeswax and gum copal are produced. Among minerals iron, tin, copper, lead, bitumen, zinc and gold have been found, but none, save iron, in sufficient quantities to make exploitation profitable. The native industries include spinning and weaving cottons, making of baskets and mats and wood-working. The principal exports are rubber, coffee, oil and nuts of palm and beeswax. The imports include salt, rice and cotton goods. In 1928 the total value of the exports amounted to $1,465,568 and of the imports a little over $4,000,000.

Growing out of American efforts to find a home for the freed slaves, the first settlement in Liberia was founded in 1822 on the site where MONROVIA, the capital, now stands. In 1847 Liberia was proclaimed an independent republic with a constitution modelled in many respects after that of the United States of America. All electors must be of Negro blood and own land. The president and his council of seven ministers share executive power. The president and members of the house of representatives are elected for four years, the members of the senate for six. The official language of the government is English. No definite figure is obtainable for the population, but it is estimated at from 2,000,000 to 2,500,000. The population of Monrovia is 10,000.

LIBERIUS, ST., pope from 352-366, during the period of the Semi-Arian controversy. He was a Roman deacon and succeeded Julius I. As Pope he supported the orthodox ATHANASIUS, Bishop of Alexandria, against the attacks of the Emperor Constantius, who favored Semi-Arianism. He resisted the Council of Arles of 353 which condemned Athanasius. In 355, however, the Council of Milan banished bishops Lucifer of Cagliari, Dionysius of Milan and Eusebius of Vercelli, and Liberius was exiled to Beroea in Thrace. Felix II (*see* FELIX) was consecrated as his successor. Returning in 357, Liberius was restored to the see in 358; Felix, the antipope, was expelled. Liberius may or may not have recovered the see by signing the so-called Formula of Hosius, renouncing Athanasius, condemning the *homoousios* and accepting the Dedication Creed of the Semi-Arians in place of the NICENE CREED: it is a disputed point. The letter *Studens paci,* found in the works of St. Hilary and presumably written by Liberius while in exile to condemn Athanasius, is considered a forgery by some authorities. In 361 Liberius annulled the decrees of the Council of Rimini of 359, which were favorable to Semi-Arianism. The Pope probably died Sept. 23, 366.

LIBERTARIANISM, a form of indeterminism. It is one doctrine in the free will controversy. It admits of freedom in the will as against scientific DETERMINISM. Freedom, however, may be variously interpreted. For example, some libertarians do not discount the rôle of habit or the influence of environment; nevertheless they insist that there remains an element of choice, inexplicable in terms of the past.

LIBERTY, a state of freedom of individuals, classes, movements or nations from external restraints imposed by force.

Political liberty means the right of the people to choose their own rulers and to form parties in opposition to the government. Applied to nations and to subject peoples it denotes freedom from alien rule. Economic liberty is either free competition for business men or freedom of workers and farmers from exploitation, and therefore indicative of a revolutionary goal. Religious liberty means the right to worship freely, and equal opportunity for all religions or none without a State Church. Civil liberty is the phrase applied to the exercise of the rights of individuals and minorities to freedom of speech, press, assemblage and the like, set forth in Anglo-Saxon countries as bills of rights against the state power. In the United States these are embodied in the Constitution and in theory sustained by the Supreme Court against encroachment by government or the majority. Personal liberty is a phrase commonly used to oppose restrictions by law on personal habits and tastes.

In the conflict of classes in all countries the right of a rising class to agitate is always asserted and fought for. This struggle for civil liberty is essentially a struggle for growth of power and for change by peaceful means. Yet these rights to agitate on the part of classes opposed to the ruling class are commonly violated, even when clearly guaranteed in law. All such struggle brings repression, legal or illegal, by troops, police, mobs, private agents and by prosecution. The class with power regards its desires as law and order; the class without power calls its desires rights. R. N. BA.

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LIBERIA



1. PHELPS STOKES FUND; 2, 3, 4, 5, 6. NATIONAL COUNCIL, EPISCOPAL CHURCH

THE LIBERIAN CAPITAL AND COUNTRY DISTRICTS

1. A laborer collecting latex on the Firestone rubber plantation at Mount Barclay. **2.** Monrovia, capital of Liberia, from the sands of Kroo-town Beach. **3.** Bush shelters, where Liberian women undergo preparation for the duties of womanhood. **4.** Dwelling (*at the right*) made by a mission-trained native who had learned carpentry. **5.** A native hut in Vey Town. **6.** A graded road outside Monrovia. The government is undertaking modern highway construction throughout the country with highly satisfactory results.

LIBERTY, in international agreements, a privilege that is granted by one state to another and which may be exercised within the jurisdiction of the granting state. The liberty so granted is not a right which can be demanded, but is merely a privilege which has been freely granted. It may or may not amount to an international SERVITUDE. A treaty of 1818 between the United Staes and Great Britain conferred upon inhabitants of the United States forever the liberty to take fish on the southern coast of Newfoundland, and also the liberty forever to dry and cure fish within certain specified harbors of Newfoundland and the coast of Labrador. In the North Atlantic Fisheries Arbitration, it was held that such a liberty, even if granted in perpetuity, could be reasonably regulated by Great Britain, but not to the extent of defeating the liberty. C. E. MA.

"LIBERTY, EQUALITY, FRATERNITY." *See* FRENCH REVOLUTION.

LIBERTY, SEIZURE OF, 1768, an incident expressive of the antagonism between people of the Colonies and officers of the Crown. The sloop *Liberty,* owned by JOHN HANCOCK, entered Boston harbor on May 9 with a cargo of Madeira wine. The tidesman attempted to prevent the landing of several casks which had not been declared at customs, but was forcibly detained while the wine was smuggled ashore, and when released was warned to keep silent. On June 9, when the sloop had been reloaded and was about to begin another voyage, the tidesman complained to the collector of the port. The following day the ship was seized and towed to anchor under the guns of the British man-of-war *Romney.* The customs officials on leaving the wharf were brutally assaulted by a mob, and property belonging to them was burned or damaged. Gov. Francis Barnard informed the commissioners of customs that he could not afford them protection; with their families they removed to Castle William in Boston harbor. The *Liberty* was condemned in admiralty court. Hancock and others were sued by the King's Advocate for obstructing officers of the Crown; but in 1769 the suit was abandoned.

LIBERTY, STATUE OF, a colossal statue on Bedloe's Island, New York harbor, presented on Oct. 28, 1886 by the people of France to commemorate the 100th year of American independence. The money for the statue, about $700,000, was raised in France, but the funds for the pedestal, amounting to $300,000, were given in the United States. FREDERIC AUGUST BARTHOLDI, a Frenchman, was commissioned as sculptor and the work was begun in France in 1878. Before completion in 1883, parts of the statue were exhibited at the Philadelphia Centennial Exposition and the Paris Exposition. The cornerstone of the pedestal was laid in 1885 on ground officially set apart by Congress in 1877. From the water level, including the base, the statue measures 301 ft. and the statue proper, to the tip of the torch, is slightly over 151 ft. high. It is made of bronze three-sixteenths of an inch thick and weighs 225 tons. There is an inner staircase of 161 steps from the pedestal to the head, where 40 persons may stand and an additional 54 steps through the uplifted right arm. In 1916, plans were made for the permanent illumination of the statue and in 1924 it was declared a national monument by President Coolidge.

LIBERTY LOAN, bonds issued by the United States Government to finance participation in the World War and to raise money to lend to the Allies. Four Liberty Bond issues and a Victory Loan were issued between May 14, 1917 and April 21, 1919. These five issues, amounting to 10 issues counting the converted issues, were for an aggregate of $21,478,357,000 of which almost half the amount received was advanced to the Allies by the United States Treasury. Flotation of the loans involved the sales of Liberty Bonds to millions of Americans and for the first time in financial history such securities were sold on a time-payment basis.

LIBERTY MEMORIAL, a monument erected in Kansas City, Mo., in memory of "those who served in the World War in defense of liberty and our country." On a succession of terraces that lift its crowning light 360 ft. above the surrounding country, a great shaft of masonry rises 217 ft. from the broad platform which tops the terraces and extends along a front 200 yds. long and 50 ft. high. To the right and left are low buildings with colonnades of classical design. From the north, steps and ramps lead up to the platform, and from the south the approach is along a wide, level, tree-lined avenue to a lawn. The entrance on this side is flanked by winged sphinxes on a large scale—32 ft. long and 20 ft. high. Near the top of the shaft, which is 35 ft. in diameter, are guardian winged figures 40 ft. high, so placed in niches that the perpendicular rise of the column is not marred. Just above the guardian figures is a bowl of light. A frieze 400 ft. long and 13 ft. high decorates the front, or north wall of the terrace on which the shaft with its colossal angels stands.

The site of the memorial was dedicated in 1921, with Marshal Foch, General Pershing, Admiral Beatty, General Diaz of Italy and General Jacques of Belgium in attendance. In 1925 the completed portion of the memorial had cost $2,500,000, but much sculptured decoration had to be added to the frieze. H. Van Magonigle of New York City was the architect.

LIBERTY PARTY, the first anti-slavery party in United States politics, 1839-48. A faction headed by Myron Holley within the American Anti-Slavery Society, having vainly attempted to commit that society to political participation, met at Warsaw, N.Y., Nov. 13, 1839, and put forward James G. Birney, executive secretary of the society, for president of the United States. A national convention met at Albany, Apr. 1, 1840, confirmed the nomination and adopted the name Liberty Party. The party represented a moderate antislavery view: "that slavery is strictly local and rests only on state legislation. All slavery within the limits of national jurisdiction should be abolished

. . . the general government has no power to establish or continue slavery anywhere." Birney spent the months immediately preceding the election of 1840 in England, lecturing, but in the election polled only 7,059 votes. Having improved its organization, the party in 1844, again presenting Birney, was able to take advantage of the dissatisfaction within the Whig party with Henry Clay, and polled 62,300 votes, including 18,812 in New York State. It is surmised that if the Liberty Party had not been in the field, Clay might have carried New York and so won election. In 1847 the party nominated John P. Hale for president. Hale, however, withdrew in favor of Van Buren, the candidate of the newly created FREE SOIL PARTY, and the Liberty Party disappeared.

LIBERTYVILLE, a city in Lake Co., northeastern Illinois. It is a residential suburb of Chicago situated 36 mi. northwest of that city and is served by the Chicago, North Shore and Milwaukee and the Chicago, Milwaukee, St. Paul and Pacific Railroads. The local manufactures are fountain pens, fencing and macaroni. Libertyville was founded in 1835 and incorporated in 1882. It is said that La Salle was brought to the sulphur springs here to be cured of malaria. Pop. 1920, 2,125; 1930, 3,791.

LIBERUM VETO, the right once possessed by any member of the Polish Diet, to veto legislation to which he was opposed. *See* POLAND, HISTORY OF.

LIBRA, an ancient Roman unit of weight, roughly equivalent to the POUND and containing about 5,050 grains. *See also* WEIGHTS AND MEASURES, ANCIENT UNITS OF.

LIBRA (gen. *Librae*), the scales, is the seventh constellation of the Zodiac and the most recent addition to it, having been named about the third century B.C. It is a late spring and summer constellation and may be found due south about 9 P.M. during the end of June. In addition to a number of faint stars it contains but two stars of the third magnitude, Alpha and Beta Librae, so nearly equal in light that it is said the constellation derives its name from that fact. *See* STAR: *map.*

LIBRARIAN, one who has charge of a collection of books. He arranges them in systematic order for easy reference, keeps records of books loaned and their borrowers, and helps and advises readers in search of specific information. In a large public library, the functions of a librarian are divided. There are cataloguers who classify and index, reference librarians who assist in research, librarians who keep the books in public circulation, others who select and purchase new volumes, and still others who specialize in one kind of books, such as children's books, foreign books, or scientific books. A background of general culture is essential and knowledge of foreign languages is an asset. While it is still possible to become a librarian through apprenticeship training in a library, only those with library-school training have much chance of advancement. Courses in librarianship are offered by many universities and by some public libraries. They include training in theory, in catalogue systems, bibliography, administration and the manual tasks of repairing damaged books and book bindings. The profession of librarian is one in which both men and women have made outstanding successes.

LIBRARIES. The origin of libraries is lost in antiquity. While evidences of written records now go as far back as 4,000 B.C. as a result of the excavations at Kish and Ur, the earliest library was discovered at the close of the 19th century at Nippur on the Euphrates, dating from about 2200-1900 B.C. Babylon and Assyria were the homes of some of the earliest libraries; one found in the palace of Ashurboni-pal at Nineveh was traced back to the 7th century B.C. or even earlier. Although no libraries of such an early period have been found in Egypt, there are references to their existence in temples and palaces. Private libraries existed among the Greeks but were not extensive. The library founded at Alexandria by Ptolemy I is said to have had from 600,000 to 700,000 volumes when it was destroyed in 48 B.C. Another great library of this period was that at Pergamun which according to Plutarch had 200,000 volumes written on parchment or vellum. Private libraries existed at Rome; but the first large libraries were made by Augustus, whose example was followed by later emperors. The early Christian Era saw the beginnings of collections of Christian writings; such were made by Alexander, Bishop of Jerusalem, 250, by St. Pamphilus at Caesarea, 309 A.D., by St. Jerome and St. Augustine.

Middle Ages and Renaissance. In the Middle Ages libraries began to be formed in monasteries, and important centers sprang up at Monte Cassino, Bobbio, Corbie, Fulda and St. Gall, the study and care of books being imposed on monastic orders of the Benedictines and Franciscans. The foundation of great collections, which are to-day the glory of great libraries, began to be made in the Renaissance period. The Laurentian library at Florence was begun by the Medici; the Vatican library was established by Pope Nicholas V in 1447. Both had been preceded by the Library of St. Mark in Venice, 1362, and the library which was begun in 1368 by Charles V and became the nucleus of the *Bibliothèque Nationale* in Paris. King Matthias Corvinus of Hungary built up one of the finest collections of manuscripts about 1460, and in 1479 the Royal Library of Copenhagen was begun. Town libraries sprang up in the same period: Ratisbon, 1430; Vienna, 1440, and Frankfort, 1484. The famous Ambrosian Library in Milan was founded in 1609.

England. In England the University of Cambridge established a library in 1475, which was revived after a period of decline in 1715. The Bodleian Library at Oxford dates from 1602, and Chetham's Library in Manchester from 1653. During the 18th century many famous private collections were made which were later bought for public libraries. Thus the British Museum was begun in 1753 on the basis of the Harley and Sloane collections. These and other libraries

were enriched by the Copyright Act, first enacted in 1709 and reenacted several times later, requiring publishers to deliver to them copies of their books.

Private collections, the libraries of special societies, universities, mechanics institutes, and other educational centers, and subscription libraries provided the chief facilities in England until the passing of the first Free Libraries Acts in 1850 and 1855 which empowered town councils to levy rates for public libraries. The United Kingdom (Carnegie) Trust began its activities after 1890 and was instrumental in securing the enactment of a law in 1919 enabling county councils to provide libraries. There are now available in England a great variety of library facilities provided by universities, the state, municipalities, counties (for rural areas), private endowed libraries, subscription libraries, libraries for the blind, and agencies for ADULT EDUCATION. A unique institution is the National Central Library created to provide students with books which they cannot purchase or borrow in their own localities; this Library has centers in London, Dunfermline and Dublin, and cooperates for exchange purpose with other libraries.

Germany and France. In Germany library facilities have always existed for the student; but it was not until 30 years ago and more particularly since the Revolution that they began to be provided for the public by the creation of city libraries. The development has been promoted by Ministries of Education, which through their sections on libraries have stimulated the provision of books in villages and rural areas and cooperation between these and city libraries. The adult education movement has also been a great factor in the development of organizations to meet the cultural needs of all classes. In France the needs are met by municipal libraries, libraries of school alumni associations, school libraries in village schools, and private societies like the *Ligue de l'Enseignement.*

The United States. In the United States the development of libraries began early in the 19th century, although collections already existed in the older colleges and in churches, fostered by the efforts of Dr. Thomas Bray, the agent of the Society for the Propagation of the Gospel. The Philadelphia Library Company, the origin of subscription libraries, was founded in 1731 by Benjamin Franklin. The LIBRARY OF CONGRESS was founded in 1800. A movement for public county libraries was initiated by a law of 1816 in Indiana, and for township and district libraries in Michigan and New York in 1835, and Indiana in 1852. The oldest public library is that at Peterborough, N.H., established in 1833. Laws for the establishment of public libraries were passed in Massachusetts in 1848 for Boston and in 1851 for all towns; New Hampshire, 1849; Maine, 1854; Vermont, 1865; Ohio, 1867, and since then in most states. The Boston Public Library was founded in 1854.

The two greatest influences in the development of libraries were the American Library Association, which since its foundation in 1876 has been devoted to the study and improvement of library organization and the professional preparation of librarians, begun in 1886, and the benefactions of Andrew Carnegie, which, beginning in 1890 with the grant of a library to Allegheny, Pa., provided the country with 1,677 buildings at a total cost of $40,908,853. Rural areas are reached through county libraries with branch stations, by traveling libraries, and by cooperation with city libraries.

The important change that has taken place in recent years has been in the conception of the function of the libraries. For a long time they were regarded mainly as repositories for books. To-day they are becoming increasingly educational agencies and assuming responsibility for directing the interests of the public through active methods of publicity. It is now recognized that libraries exist to provide information, instruction and recreation. Through circulating departments, reference rooms, and readers' advisory services as well as through the improvement of technical devices in the form of book lists, bibliographies and card catalogues in whose preparation the Library of Congress participates, libraries are discovering increasing spheres of influence. Thus the American Library Association through its series, *Reading with a Purpose,* is furnishing useful guidance to adult readers. The more recent development of school libraries and instruction in the use of books has become an important method of cooperation and of awakening interest in the place of the library in public life. I. L. K.

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LIBRARY OF CONGRESS, the national library of the United States, established in 1800. It is one of the three largest libraries in the world, having approximately 4,000,000 printed books and pamphlets in 1930. The library was destroyed in 1814 when the Capitol, in which it was housed, was burned. In 1851 more than half of the books were again destroyed by fire. In 1897 the Library of Congress building, which cost approximately $7,000,000 and occupies three and three-quarters acres of land, was completed and the collection transferred from the Capitol. Congress makes annual appropriations for the maintenance of the library.

The books and pamphlets in the library include deposits under the copyright law, gifts from individuals, exchanges of the Smithsonian Institution, publications from foreign governments and its own purchases. The library carries on extensive research work which is available for other libraries in the country and individuals engaged in research. It is open to the public as a reference library and maintains an interlibrary service with other libraries, loaning them books and supplying them with bibliographical information. The catalogue cards of the library are found in the larger libraries throughout the country.

LIBRARY SOCIAL SERVICE. The library of today assists in all lines of social science and renders

social service by furnishing free to the people books, magazines and pamphlets, and by providing pictures, posters and museum material. These are selected with care to develop an interest and knowledge on the part of the public and to aid those engaged in work along social science lines. This material is circulated freely outside of the library or may be used in the reading or study rooms provided by the library.

To make such material available libraries put in charge of each department persons familiar with their respective subject and trained in the use of material; compile bibliographies for general distribution and for special programs of study or work; do research work on subjects submitted; furnish programs for study; act as a bureau of information; employ advisers on bibliographical subjects; and to supplement their own material borrow or buy special books or material desired. Libraries act as a publicity bureau for lectures, clubs, classes and civic undertakings.

The library system of the United States is aided by the American Library Association. The Library of Congress at Washington aids all libraries by publishing bibliographies and lending expensive books. Almost every state has a public library commission or some other state agency which acts as a central bureau of promotion and aid for the libraries of the state. By interloan service between libraries through state and national agencies the smallest libraries have access to resources which enable them to serve not only the general public but also the scholar.

Local libraries supply library service in large communities. For sparsely settled districts township and county libraries supply the same service through branches, stations and traveling book wagons which at regular intervals bring books to schools, small communities and individual rural homes. Until local or county libraries can be established the state library extension agency supplies books for study and reading direct to individuals and groups of people without libraries through special loans and collections of books called traveling libraries. S. B. A.

LIBRATION, a slight swinging back and forth of the MOON with respect to the earth. As a result of libration we sometimes see a little more around one side, sometimes around the other.

LIBRETTO (Italian, little book), the text of an opera or other musical composition. The art of the libretto, originating in Italy in the 16th century, reached its highest point in the musical dramas of RICHARD WAGNER, the only truly great composer capable of writing his own libretti. The good libretto presents its situations with dramatic logic and unity, in language of genuine beauty and power. *See also* OPERA.

LIBYA, the name which the Greeks gave to the continent of Africa. At the first Libya was not known to them as a continent, Africa being thought to be a part of Asia. It was not until the time of Herodotus, 484-425? B.C., that Libya was suspected of being surrounded by water. The historian relates a supposed voyage of Necho during which the continent is said to have been circumnavigated. The best evidence for the event's having taken place is that the sun appeared on the right hand of the voyagers, indicating that the Cape must have been rounded. Of greater authenticity, however, was the voyage of Hanno under Carthaginian auspices, but it is not known how far south he ventured. Even the shape of the continent remained largely a matter of conjecture until Vasco De Gamma rounded the Cape of Good Hope in 1497. For all practical purposes Libya, to the ancients, extended only to the Equator. It was divided into three regions, the first being that corresponding to the Barbary States, the second, the region of wild animals, and third, the Libyan Desert, the Sahara. Fantastic stories were told about this desert region. For a long time Egypt was not regarded as a part of Africa but was thought to be a part of Asia. In a more restricted sense the term Libya was applied to that part of the continent between Egypt and Marmarica, or that portion corresponding to the modern state of Tripoli.

LIBYAN DESERT, a northern region of the African continent, situated west of the Nile and constituting a part of the Sahara. It is bounded on the north by Tripoli, on the east by Egypt and Nubia, on the south by Darfur and Wadai and on the west by Fezzan and Tibesti. On the west side, separated by low, rocky promontories, the continent shelves down towards the Mediterranean in gradations of flat, extensive and sandy deserts, almost barren of vegetation. On the east this region stretches almost as far as the Nile Valley. A succession of penetrating indentations contains the famous oases, Bahriyeh, ElDakhel, Farafreh, Kargheh and Siwah, which somewhat relieve the devastating aridity. Few caravans travel through this portion of the Sahara.

LICHENS, an extraordinary group of flowerless plants exhibiting perhaps the most perfect case of SYMBIOSIS in the plant world. The mature plant is the familiar flat patch of grayish, grayish-green, or brown, almost leaf-like structures commonly attached to rocks or bark. Whatever its form, and some like the REINDEER Moss are pendant in the trees, a lichen is in reality three organisms. (1) There is the lichen itself which bears a Latin name, like any other plant. (2) Within the lichen, and making up most of the total plant body is usually *Ascus fungus,* living in the closest possible co-partnership with, (3) A green or blue-green terrestrial alga.

The fungus part of the lichen body makes no food, but lives on the food manufactured by the green, and consequently chlorophyll-containing alga. The fungus contribution to the complete organism appears to be its much greater capacity to hold water, which the alga needs in order to function. To the fungus must be credited the capacity to carry lichens over long periods of drought. Lichens are thus always a commingling of an alga and fungus in one body. They have been experimentally produced by bringing together fresh cultures of the known alga and fungus constituents. Some synthetic lichens, wholly un-

known in the wild state, have been so created in the laboratory.

Besides exhibiting perfect symbiosis, lichens, at least the rock-inhabiting kinds, secrete a disintegrating fluid which helps materially in the process of converting rock to soil. While this action is slow, the cumulative effect is considerable. Beyond furnishing a negligible food supply to some northern races of men, and a considerable one to caribou and reindeer, the only economic importance of lichens is LITMUS. This dye is obtained from lichens of the genera *Rocella* and *Lecanora.* N. T.

LICHFIELD, a pleasant town in Staffordshire, England, famous both as the seat of a beautiful cathedral and as the birthplace of Samuel Johnson. The Three Crowns Inn holds associations of Johnson and Boswell, and the town is rich in other fascinating suggestions of celebrities of the 18th century, having been the home of Erasmus Darwin, David Garrick, Thomas Day, Anna Seward and the parents of Maria Edgeworth.

The red sandstone cathedral beyond its green pool has been called the "Queen of English Minsters," and through symmetry and picturesqueness achieves a distinction of its own. It was built between 1190 and 1350, the choir being the oldest portion. It has three graceful spires, and a singularly beautiful west front. The nave, whose triforium is unusually tall and fine, was erected about 1250, and the façade is of the late 13th century. Lichfield is unique among English cathedrals in that its curved lady chapel forms a single Gothic apse. This was built about 1300 and has fine glass of the 16th century brought from Belgium in modern times. The long octagonal chapter house also is noteworthy. The cathedral's library contains a Saxon copy of the Gospels, dating from before 700, and an illuminated manuscript of Chaucer's *Canterbury Tales.* Pop. 1921, 8,393; 1931, 8,508.

LICINIAN LAWS. The passing of these laws was a political victory of the plebeians at Rome, 367 B.C. The plebs, in their effort to secure political equality with the patricians, sought the right to public office. The quaestorship, a subordinate position, had been held by a plebeian in 421 B.C. These laws, proposed by C. Licinius Stolo and L. Sextus, tribunes of the plebs, provided: that one of the two consuls must be of that order; and that half of the priests in charge of the Sibylline books, increased from two to ten, must be plebeian. An agrarian provision, favoring the plebs in land distribution, by limiting the amount to be held by one person, was also a part of this miscellaneous legislation, but was not enforced, and two centuries later was included in the GRACCHAN LAWS.

LICORICE, the common name for a genus (*Glycyrrhiza*) of plants of the pea family, comprising about 12 species native to the Mediterranean region, tropical Asia and the New World. A single species (*G. lepidota*) occurs in the United States. The licorice of commerce is obtained from the sweet gummy roots of an Old World species (*G. glabra*), extensively cultivated in Europe and Asia, Italy and Spain yielding the finest grades. The licorice plant is a perennial herb, 2 to 3 ft. high, bearing pinnate leaves, clusters of pale blue pealike flowers and a burlike fruit. The



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AMERICAN WILD LICORICE

Flowering branchlet, cluster of pods and single pod

dried root or extracts made from it are used as a remedy for coughs and colds, for flavoring tobacco, liquors and confections and to disguise the unpleasant taste of various medicines.

LICORICE POWDER. *See* CATHARTICS.

LICTORS, attendants carrying the FASCES who accompanied the highest civil and military officers of Rome in the performance of their duties; they carried messages, executed the orders, attended as guards and, outside the city, inflicted capital punishment for the magistrates whom they accompanied.

LIE, JONAS (1880-), American painter, was born in Norway, Apr. 29, 1880, and came to America in 1893. He studied at the National Academy of Design and at the Art Students' League in New York. He has painted landscapes and pictures of the Panama Canal. Among his works are *The Conquerors,* Metropolitan Museum, New York; *Culebra Cut,* Detroit Institute; and *The Fisherman's Return,* Boston Museum.

LIE, JONAS LAURITZ IDEMIL (1833-1908), Norwegian novelist, was born at Eker, Nov. 6, 1833. Part of his boyhood was spent at Tromso, the chief city of Nordland. He studied law and practiced successfully at Kongsvinger. The collapse of a timber speculation swept away his fortune, and he removed to Oslo (Christiania), determined to make his living by his pen. After several years, his first novel, *The Visionary,* was published. This was based on the author's childhood impressions of Nordland, and it enabled him to revisit the region. The result was another Nordland novel, *The Barque Future.* His next novel, *The Pilot and His Wife,* deals with life at sea and in the shipping town of Arendal. Among Lie's other books are *Rutland, Go Ahead!, The Life*

Prisoner, The Family at Gilje, A Maelstrom, The Commodore's Daughters, A Marriage, Dyre Rein, When the Sun Goes Down, Niobe, Faste Forland and *When the Iron Curtain Falls.* He died at Oslo, July 5, 1908.

LIEBER, FRANCIS (1800-72), German-American publicist, was born in Berlin, Mar. 18, 1800. He served in the Prussian army and in the Greek War for independence. His radical ideas caused his arrest on political charges although he was never brought to trial. After he was released he received his degree from the University of Jena and in 1827 he emigrated to the United States. He was editor of the *Encyclopaedia Americana,* 1827-32 and afterwards became professor of history and political economy at South Carolina College, Columbia, S.C. In 1856 he was a member of the faculty of Columbia College in New York, where he taught political science. He died at New York Sept. 2, 1872. His works include: *A Manual of Ethics, Civil Liberty and Self-Government,* and many others of a political nature. As an authority on political law Lieber held an enviable position and his contributions to political science are extremely valuable.

LIEBIG, BARON JUSTUS VON (1803-73), German chemist, was born at Darmstadt, May 12, 1803. He studied at Paris and became professor at Giessen in 1824. He was made Baron in 1845 and in 1852 became professor of chemistry at Munich. Liebig enormously advanced chemistry, both in his personal investigations, particularly in organic compounds, and in the great number of eminent chemists whom he trained. He established that the chemistry of the organic world was identical with that of the inorganic, and that plants alone assimilate inorganic compounds to form the organic upon which animals can live. He discovered and analysed a great number of carbon compounds and established the importance in vital metabolism of albuminous and nitrogenous compounds. He died at Munich, Apr. 18, 1873.

LIECHTENSTEIN, a small principality of Europe; to the north is the right bank of the Rhine just above Lake Constance, to the west are the Swiss cantons of St. Gallen and Graubunden, to the east is Austrian Vorarlberg, while to the south are the Rhatikon crests. With an area of but 65 sq. mi., the country is divided into two counties: Schellenberg and Vaduz. Vaduz, the capital, has 1,715 inhabitants. The people are of German origin and are predominantly Catholic, 9,492 being of this faith while the Protestants number but 253. The chief occupation is agriculture and the leading products are corn, cattle, wine, fruit, turf, wood and marble. Cotton weaving and spinning and the production of leather goods and pottery are the most important industries.

This tiny state was created as a direct principality of the Holy Roman Empire by the union of the lordships of Vaduz and Schellenberg, approved by the Emperor Charles VI in 1719. The dissolution of the Empire by Francis II in 1806 left the principality a sovereign state. As such Liechtenstein was a member of the Confederation of the Rhine from 1806-15, and thereafter of the German Confederation until the latter's destruction in 1866 left the principality completely independent as it has since remained. Until 1919 Liechtenstein had a customs union with Austria.

The constitution of 1921 provided for a Diet of 15 members, elected for four years by direct vote on the basis of universal suffrage and proportional representation. For the year 1931 the estimated revenue is 1,733,100 francs, the estimated expenditures being 1,314,339 francs. Since 1921 Swiss currency has been in circulation. In 1924 Liechtenstein has belonged to the Swiss Customs' Union. The monetary unit is the franc. Francis I ascended the throne of Liechtenstein in 1929. Pop. 1930, 10,213.

LIÉGE, an important city in Belgium, capital of the province of Liége, situated on the Meuse. It is the seat of Walloon culture, as distinct from the Flemish, in Belgium. Of the four universities of Belgium the University of Liége, with about 2500 students, is second in size. The cathedral dates from the 10th century, and was rebuilt in the 13th. In 1794 Liége was annexed to France, and in 1815 was made part of the new kingdom of the Netherlands. It took an important part in the revolution which established the independence of Belgium in 1830. The German attack upon the strongly fortified city was the first engagement of the World War. Although the town was entered Aug. 7, 1914, the last fort did not fall until Aug. 16, 1914. Liége lies close to the coal and zinc mines, and is the center of the Belgian iron industry. In addition to its blast-furnaces, it has machine shops and other industries, and a large cattle-market. Pop. 1930, 168,280.

LIEGNITZ, a German industrial city in the province of Lower Silesia, located about 40 mi. west and north of Breslau. Its notable buildings include the Glogau tower gate, the castle, destroyed by fire and rebuilt in 1835, St. John's Church, rebuilt in 1714-30 in Baroque style, two ancient fountains, the old rathaus of 1734-41 and the Peter-Paul Church of the 14th century. On the east side of the city are splendid parks. The city's industrial activities include food canning, textile weaving and machine construction. Liegnitz was the residence of the dukes of Lower Silesia from 1163 until the line became extinct in 1765. It became Prussian in 1742. Pop. 1925, 73,123.

LIEN, a legal hold on real or personal property for debts to be paid, or duties to be fulfilled. It is limited to the particular piece of property, directly or by implication of law, to secure the obligation. To make a lien general as well as particular, the terms must be stated in the contract. At common law a lien could arise from custom as well as express agreement. Liens usually imply a bailment, but not in the case of salvage of a ship and other exceptions. In the U.S. some states regulate liens by statute. There are attorney's liens for service, MECHANIC'S LIENS for work on buildings. *See also* BUILDER'S LIEN.

LIEPAJA (LIBAU), a port and capital of the Latvian district of Courland, situated on a narrow

strip of land separating the Bay of Liepaja from the Baltic Sea. It has Greek Catholic, Roman Catholic and Protestant churches and a sulphur bath; it produces metal goods, cork, linoleum, matches and other diversified manufactures. The harbor is excellent and during most of the year is free from ice. The chief imports are textiles, chemicals, machines, wheat and sugar, and the exports, lumber, flax, butter, linseed and meat. It was capital of Latvia in 1918-19. Pop., 1930, 57,238.

LIERRE, a city in the Belgium province of Antwerp, on the Nethe River. It is a railroad center and has a 14th century Gothic church with excellent paintings, a municipal museum and a city hall with a belfry. It produces lace, embroidery, beet-sugar, shoes, salt and beer. In medieval times it was noted for its cloth industry. Pop. 1930, 27,700.

LIEUTENANT, a military title and rank next to captain in the army and lieutenant commander in the navy. A lieutenant in the army functions as an assistant to the captain. Army lieutenants are ranked as first and second lieutenants. In the navy there are senior and junior grade lieutenants, the former ranking with a captain and the latter with a first lieutenant in the army.

LIEUTENANT-COLONEL. *See* COLONEL.

LIEUTENANT-GENERAL. *See* GENERAL.

LIFE, FUNDAMENTAL CHARACTERISTICS OF. Living things possess certain fundamental characteristics that distinguish them from non-living objects. These characteristics taken singly are not sufficient criteria of life but when taken together may be used to determine whether an object is living or lifeless. Among these characteristics are the following: 1. Definite size; non-living bodies may usually be of any size; for example, water may exist as an ocean or as a minute particle of vapor; living things on the contrary, are restricted in size and the individuals of any particular species vary within small limits. Many animals and plants are so small they can be seen only with the aid of a microscope, and others are as large as whales but the size any species may attain is rather definite. 2. Definite shape; non-living objects may be more or less definite in shape, but often assume the form forced upon them by their surroundings; living organisms vary to a certain extent in shape but are so constant in this respect that there is no difficulty in distinguishing one species from another. 3. Definite chemical composition; the elements of which living matter is composed all exist in non-living bodies but only in living organisms are they combined in such proportions as to form a substance known as protoplasm—a substance that may be called the physical basis of life. There are as many different kinds of protoplasm as there are living things but it contains typically the following four elements which make up 97% of its weight: oxygen 65%, carbon 18.5%, hydrogen 11% and nitrogen 2.5%. Besides these there may be small amounts of phosphorus, chlorine, potassium, sodium, magnesium, calcium or iron present. Protoplasm is in a colloidal state, a colloid being matter divided into particles larger than a molecule and suspended in a medium of different matter. 4. Definite organization; living organisms do not consist of a continuous mass of protoplasm but all animals and plants consist of one or more small units known as cells. Each cell consists of protoplasm in which is one or more nuclei. There is no comparable unit among non-living bodies. 5. Metabolism; living organisms carry on metabolic processes. They take in food which they reorganize into protoplasm, the new particles being arranged among the preexisting particles. This type of growth by intussusception differs fundamentally from that of certain non-living bodies which become larger by the addition of particles on the outside, that is, by accretion. 6. Reproduction; living organisms reproduce others of their kind. This is not possible for non-living bodies. 7. Irritability or reactiveness; living organisms are irritable and respond to changes in their environment. The change is the stimulus that brings about the response, and the response constitutes the organism's behavior.

No one knows for certain where life originated. Scientists now believe that living organisms originate only from preexisting organisms. Where life first began is still unknown. The meeting point of sea and land is a possible place of origin. The presence of moisture and a large variety of chemical compounds favor the surface layers of the earth itself as the mother of living organisms. R. H.

LIFEBOATS. *See* BOAT.

LIFE CYCLE. In the higher animals and plants, life presents the contrast of permanence through a continuity extending back for untold generations into the past, and the impermanence of each individual generation which passes through its life cycle and dies.

The epochs into which the life cycle may be divided are largely determined by the characteristic life span of each individual form of life. Prevailingly there may be recognized periods of development, maturity and a senescence terminated by death as a natural event. Likewise the normal length of life is characteristic of each species and varies from a few hours in some lower forms of life to several thousand years for some trees. It is of course obvious that relatively few organisms attain the full normal life span.

In man and mammals generally where individuality is pronounced, it is customary to divide the developmental period into a prenatal, subdivisible into embryonic and fetal, and a postnatal, in turn divisible into infancy, childhood and adolescence. During the embryonic period the characteristic structures and organs of the body are forming; in the fetus the bodily organs are largely formed. Infancy is the period of nursing and childhood terminates with the onset of adolescence.

In the lower animals the developmental period is not infrequently set off as a larval period through the interpolation of a metamorphosis marking an abrupt change in the life habits and a corresponding alteration in bodily form. Metamorphosis is most extreme in the higher insects, such as butterflies, moths,

flies, bees and wasps, although marked in many animals, e.g., the transformation of tadpole to frog. In some instances as in crustacea two or more transformations interrupt the continuity of the developmental process. In the larval period the larva is self-supporting although not so in the embryonic period which precedes it.

Plants exhibit a characteristic life cycle of two antithetic and supplementary phases, the gametophyte and the sporophyte stages, the former sexual, the latter asexual. In the lower plants, as algae and mosses, the gametophyte is predominant, in the higher, as the ferns and phanerogams, i.e., common plants, it is the sporophyte that is represented, the gametophyte phase being greatly reduced in the last group. In the higher plants likewise the embryonic period of the sporophyte is characteristically interrupted by a dormancy in the seed important for dispersal and germination.

It would appear that it is only in organisms of appreciable size and complexity of structure that a life cycle culminating in aging and death is found. Among the Protozoa, e.g., *Paramoecium,* where reproduction is by division into two or fission, it appears that the process may be continued for thousands of generations without sign of deterioration or death.

B. F. K.

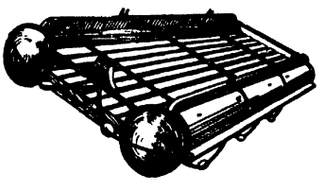
LIFE INSURANCE, a contract whereby, in consideration of the payment of a sum of money called a premium, the insured receives from the insurer a promise that a named survivor will be paid a stipulated amount in the event of his death. The money paid after death is called the benefit and the one who receives it is known as the beneficiary. The contract, entered into only after the insured has passed a medical examination, is kept alive by the annual, semi-annual or quarterly payment of the premium.

There are many types of life insurance, each one designed to meet a different need. Ordinary life, or whole life, is the most popular, being a simple contract such as the one described above. Term insurance is a modification of this, affording protection only over a stated period of years and lapsing without benefit to the insured if he survives the period. Limited-payment life is another form. It provides that the insured, upon making premium payments over a stipulated number of years, may cease making payments without losing the benefit of protection from then on. There is also endowment insurance, which promises the customary payment in the event of death but which further agrees to pay the stipulated benefit in full to the insured should he survive the period of making payments. Joint life is still another type of insurance, providing that upon the death of one of a group of two or more persons, the survivors shall receive the benefit. In the matter of paying the benefit, arrangements may be made to have it divided into yearly instalments, thereby providing a sort of ANNUITY for the beneficiary.

In each of these instances, as well as with the many other arrangements that are possible, the premium rate varies with the age of the insured and the kind of protection he desires. The older the man, the higher the premium, is the general rule. The other governing factor is the type of policy desired. Term insurance, for instance, is quite inexpensive because of the limited nature of its protection. Endowment insurance, because it is essentially a savings device, carries a much higher rate. Fundamentally, the basis of all insurance calculations are the LIFE TABLES, for upon them is constructed the compound interest calculations which are necessary to keep intact the general fund (*see* INSURANCE).

Many life insurance policies have a cash surrender value. Should the insured find it impossible to carry on premium payments, he may recover a portion of the money he has paid in, the portion being dependent upon the number of payments he has made after a stated period, generally two years. The same policies have a loan value as well, 90 to 95% of the cash surrender value being the amount which can be borrowed.

LIFE-PLANT (*Bryophyllum pinnatum*), a stout fleshy perennial of the orpine family called also air-plant and floppers. It is now widely distributed by cultivation in tropical and subtropical countries, and is believed to be native in the East Indies. The smooth hollow stem grows 1 to 6 ft. high bearing opposite, divided leathery leaves and numerous reddish flowers in large clusters. Young plants are produced from the leaf margins. In botanical laboratories the plant is often grown to illustrate natural propagation by means of leaves.



COURTESY COSTON SUPPLY CO

METAL CYLINDER LIFE RAFT

LIFE RAFTS, as installed on vessels, generally consist of two long cylindrical tanks connected by a wooden platform. Their size and construction for ships built in the United States come under the U.S. Steamboat Inspection Service.

BIBLIOGRAPHY.—*General Rules and Regulations,* U.S. Steamboat Inspection Service.

LIFE SAVING EQUIPMENT comes under the jurisdiction of the U.S. Steamboat Inspection Service for vessels built in the United States, and under the Board of Trade, London, for those built in Great Britain.

The U.S. Steamboat Inspection rules state the number of life boats to be installed on a vessel, the number of persons a life boat is to carry, and have general supervision over the design of the boats and their equipment as rope, oars and food supplied, and the method (*see* DAVITS) of lowering them into the water. Besides ordinary life boats, motor-driven life boats must be installed in large ocean-going vessels.

The rules also cover the number of life rafts, life floats, life preservers, ring buoys, line carrying guns with projectiles and rockets. All equipment called for by the Steamboat Inspection rules is inspected by

their representatives, and if not up to requirements is condemned. Furthermore, the equipment as installed on a vessel is periodically inspected, and care is exercised that it is kept at all times in good serviceable condition.

BIBLIOGRAPHY.—*Rules and Regulations,* U.S. Steamboat Inspection; American Bureau of Shipping Rules; Lloyd's Rules; *Report of London Convention for Safety of Life at Sea,* Department of Commerce.

LIFTS. *See* ELEVATORS.

LIGAMENT, a band of CONNECTIVE TISSUE joining bones together or passing from one part of a bone to another part. Ligaments are found chiefly in relation to joints. Here they are composed of parallel, longitudinally-directed fibers surrounding the joint capsules, forming connections which are sometimes tough and inelastic, sometimes pliant and flexible. While most ligaments are composed of white collagenous fibers, some few are formed of yellow elastic fibers. In man the latter are chiefly the ligamenta flava of the spinal column. An elastic ligament of this nature in grazing animals enables the head to be carried without requiring muscular power. *See also* JOINTS AND LIGAMENTS.

LIGATURES, the threads or strings, commonly prepared from the intestines of sheep, and used for sewing or tying wounds or other surgical purposes. As the wound heals, the ligature is gradually absorbed by the body. Thus the stitches entirely disappear. Through research and experience, methods of making ligatures have been developed that render them more or less resistant to absorption. Thus a surgeon can select one that will last sufficiently long to serve the desired purpose and then dissolve.

LIGGETT, HUNTER (1857-), American army officer, was born in Reading, Pa., Mar. 21, 1857, and graduated in 1879 at West Point. He served in the Spanish-American War in Cuba and in the Philippine insurrection; in the mobilization of American troops on the Mexican border in 1914; from April, 1916, to April, 1917, he was commander of the Department of the Philippines, and later in 1917 of the Western Department. He went to France in Sept., 1917, where during the World War he commanded the 41st Division of the A.E.F. (Sept., 1917, to Jan., 1918); the 1st Army Corps (Jan. to Oct., 1918) and the 1st Army, as lieutenant-general, from Oct. 15 to Nov. 11, 1918, and later until Apr. 20, 1919. He led commands in the second battle of the Marne and in the battles of St. Mihiel and Meuse-Argonne. In 1919 he commanded the 3rd Army in the occupation of the Rhine. He retired from active service in 1921 with the rank of major-general, having received the Distinguished Service Medal of the United States and many decorations from the Allied governments.

LIGHT, that form of radiant energy which acts upon the eye as to make visible the object from which it comes. The chief phenomena concerned, whose existence is independent of any theory, are reflection, refraction, dispersion, interference and polarization (see separate articles on these subjects). The most recent determination of the speed of light, made by Michelson, gives it as 2.99796×10^{10} cm., approximately 186,000 miles, per sec. in free space or ether. For other media it is less by the factor called index of refraction.

The Newtonian corpuscular, or emission, theory (*see* CORPUSCULAR THEORY) considered light to be propagated as a stream of material particles. The undulatory or WAVE THEORY considers radiant energy as propagated in waves that vary in length, those affecting the eye having about 40,000 waves per inch in the red and about 70,000 per inch in the violet portion of the SPECTRUM.

Any wave theory of light implies that all broad relationships regarding wave motion hold for light, such as forward propagation, reflection and refraction, as well as certain relationships peculiar to light.

To account for wave motion in free space, ether was assumed to be a medium filling all space, capable of some elastic-inertial movement; thus, the waves have been called ether waves. According to Maxwell's ELECTROMAGNETIC THEORY, radiant energy is generated by oscillations of electric charges, the energy of the oscillations being propagated as a wave with electric and magnetic components, its planes at right angles to each other and transverse to the directions of propagation. Many attempts have been made to devise a mechanical structure of the ether which would account for the phenomena of light, but have had no significant success. Many scientists believe that ELECTROMAGNETIC WAVES involve solely a periodic changing of the strength of an electric and magnetic field at a given point, and do not require real motion of any medium or parts of a medium. They, therefore, find the hypothesis of an ether unnecessary and superfluous.

In certain experiments, light acts more as if made of particles than waves. This characteristic increases when the WAVE-LENGTH decreases, as in the ultra-violet and X-RAY region. The difficulties of theory encountered have led to a new corpuscular theory (*see* QUANTUM THEORY) in which the light particles are called PHOTONS, but which is not viewed, except in a very broad way, as a revival of Newton's corpuscular theory. It seems that any theories regarding the photon must not be inconsistent with electromagnetic theory. *See also* VELOCITY OF LIGHT. P. I. W.

BIBLIOGRAPHY.—J. K. Robertson, *Introduction to Physical Optics,* 1929.

LIGHT, ARTIFICIAL, IN TREATMENT OF DISEASE. Ultra-violet rays, whether from the sun or from artificial sources, have been shown by critical evidence to be effective in a small number of diseases. These rays will prevent and cure rickets, and are useful in tetany, spasmophilia, certain forms of tuberculosis and in some skin diseases.

Two sources of artificial light have been developed —the carbon arc and the mercury quartz vapor lamps. There are two general types of carbon arc lamps, one of high amperage needing a special power circuit, used chiefly in institutions to treat groups of patients,

and a lower amperage lamp for single treatments. The main feature of the mercury quartz lamp is a quartz tube containing mercury which vaporizes when the current is passed through the mercury. There are two forms, the air cooled for general body treatments and the water cooled for local work. These lights emit shorter ultra-violet rays than does the sun or the carbon arc lamp. (*See* FINSEN, NIELS RYBERG.)

In rickets, cod liver oil, viosterol and ultra-violet radiation are generally accepted as specific agents in the prevention and cure of active disease in infants. Viosterol is of advantage because of its concentration. Ultra-violet radiation doubtless produces a variety of physiologic effects including influences on the blood and circulation which remain to be carefully evaluated. The main difficulty is the lack of information of the amount of ultra-violet radiation needed. A combination of cod liver oil, viosterol and ultra-violet radiation seems most desirable. (*See also* RICKETS.)

The main reliance in tuberculosis is still in rest, hygiene and diet, but ultra-violet radiation is one of the most important adjuvants in the treatment. Sunlight is still the best source of ultra-violet light. Mayer of Saranac Lake believes that artificial sources of light are not to be relied upon as important aids in the treatment of pulmonary tuberculosis. Even sunlight in pulmonary tuberculosis, leaves much to be desired. Also the dangers of artificial light are such as to make this form of treatment hazardous unless carried out under expert supervision. So far as cases of pulmonary tuberculosis are concerned, nothing but failure will result if cases are treated when the patient's temperature is 100°F. Treatment should be stopped then, and the patient be kept at rest in bed. Treatment can be resumed when the temperature falls to normal, and the dose must be lowered. It is probably better to under-expose the patient than to over-irradiate him. (*See also* HELIOTHERAPY.)

The aim of ultra-violet radiation therapy is to find the part of the radiant energy spectrum which is specific or, at least, best adapted for use in tuberculosis. Some work has been done along this line by Phelps. He states that the wave-length band lying between 320 and 380 millimicrons was studied both clinically and experimentally and was found to be active. The chief effect is an acceleration of the processes of repair which may or may not be specific for tuberculosis, but which is essential in the retention of function. It is an indirect effect, general rather than local. Longer exposures can be given if the erythema and tan-producing rays, 300 to 320 millimicrons, are of small quantity or absent. Erythema and pigmentation, therefore, are of no use as a basis of dosage given.

Sunlight is the treatment of choice for bone and joint tuberculosis, graduated exposures of the body being usually made according to the method of Rollier, together with the use of diet, hygiene and necessary surgical measures. General exposures are made with additional local exposures over the area of disease. In bone and joint tuberculosis, a weight chart should be kept and watched carefully as this is one of the most important guides to the progress of the cases. X-rays with at least two views of the joints should be made at intervals of three months. Proper orthopedic measures should always be taken.

In laryngeal tuberculosis, general body radiation should be combined with suitable local treatment. With proper care and conscientious supervision, the results obtained by ultra-violet radiation in tuberculous peritonitis and intestinal tuberculosis are quite encouraging. The greatest caution is necessary in the matter of exposure and the method of gradual body exposures, starting at the feet, after the method of Rollier, should be followed with either natural or artificial radiation.

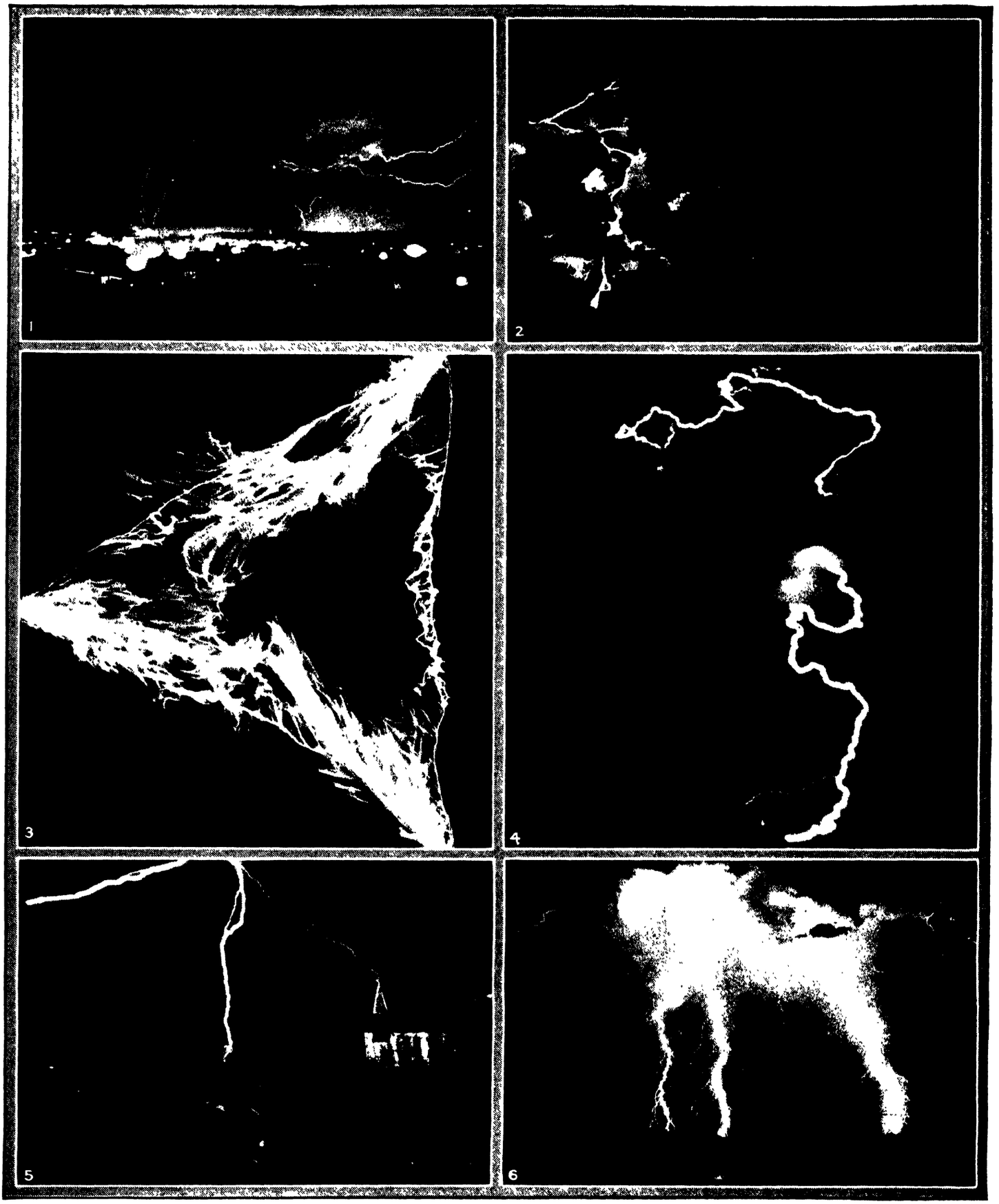
In lymphatic tuberculosis, excellent results have been obtained with ultra-violet radiation. Local irradiation of the glandular area should be made in addition to general irradiation of the body.

In skin diseases at present ultra-violet light tends to be more an adjunct than a specific method of treatment. Some cases of psoriasis will clear up remarkably well under ultra-violet radiation and others will fail to respond or even be made worse. In alopecia areata of recent origin an active hyperemia, or increased circulation in the skin, may be produced by intensive doses of ultra-violet light; improvement cannot be expected without this hyperemia. Hyperemia produced by irritants, where the destruction is not too great, will produce equally good results. In some cases of baldness there is a tendency to a degeneration of the hair follicle and ultra-violet light may produce a fine fuzz which does not develop further, and which tends to fall out. In acne vulgaris, or chronic pimpling of the skin, the best result with ultra-violet light is obtained in the acute stages, where there are a small number of blackheads with some acute inflammation and a rather large amount of oily secretion. In tuberculosis of the skin, such as lupus vulgaris, the production of a second degree reaction, locally, brings improvement. The clearing up of systemic tuberculosis also is a factor in the treatment of local skin tuberculosis.

Ultra-violet radiation has a definite value in the treatment of some diseases of the eye. Local treatment is of benefit in corneal ulcer, tuberculosis of the cornea and conjunctiva, trachoma and blepharitis. Herpetic lesions show the most marked effect of such treatment. General body radiations are of benefit in phlyctenular keratitis and in ocular conditions due to tuberculosis.

The susceptibility to common colds has been reduced 40% according to Maughan and Smiley of Cornell in a series of experiments on college students over a period of several years. This has not been confirmed by like experiments elsewhere.

Ultra-violet light has, therefore, a limited but useful place in the treatment of disease. It should not be used or regarded as a "cure all." As may be seen from the treatment of pulmonary tuberculosis, it also is definitely dangerous when used in these cases with a temperature. It may definitely activate this disease



1, 2, 4, 6, COURTESY U. S. WEATHER BUREAU; 3, 5, GENERAL ELECTRIC CO.

SIX MANIFESTATIONS OF LIGHTNING FLASHES

1. A lightning flash over the downtown district of Spokane, Wash., on Sept. 11, 1930. **2.** Lightning flashing behind clouds at Toronto. The bolt struck at the bright spot indicated here in the lower left-hand corner. **3.** Artificial lightning of 1,000,000 volts, produced between sharp points in a 60-cycle arc. **4.** A lightning bolt over Milwaukee, Wis., June, 1929. **5.** A 2,000,000-volt lightning bolt, artificially produced over a miniature village. **6.** Diffused lightning flashes brilliantly illuminating the area beneath. *Photo taken in 1888.*

when it is latent if given in an overdose. It is, therefore, advisable to use ultra-violet lamps only by direction of a physician. *See also* ROENTGENOLOGY AND ROENTGENOTHERAPY. J. S. C.

LIGHTER, a flat bottom, square ended, decked over craft with or without a house, built for carrying machinery and heavy products, that is towed around a harbor. Or the lighter may be given a ship shape, and be propelled by a steam engine and boiler, in which case it is known as a steam lighter.

LIGHTHOUSES, structures for displaying lights at night and operating fog signals in thick weather to warn or guide navigators. They may be divided into two classes, one surrounded by water that is built on a reef, and the other on land. Those on reefs may be of steel or stone, steel only being used in harbors and sheltered waters. Examples of this type are the Pacific Reef Light off the Florida coast, and Martin Reef Light on Lake Huron.

The building of stone lighthouses on reefs, particularly those below the surface of the water, requires the greatest care to secure a suitable foundation. Above the water they are circular in cross section, and are often built of granite blocks dovetailed together. No serious difficulties in construction arise on those erected on land, as at Highlands, N.J., and Richmond, Staten Island, N.Y.

Of the well known lighthouses on dangerous reefs are the following: Minots off Cohasset, Mass., Eddystone off Plymouth, Eng., Bishop Rock off the Sicily Island and Fastnet on a reef off the southwest coast of Ireland.

The earliest lighthouses, built over 2,000 years ago, used wood fires, and adopted, in turn, tallow candles, then lamps burning whale oil, colza oil, kerosene, kerosene oil vapor, acetylene gas and electricity. Kerosene wick burners were developed to a high state of perfection, the largest being $4\frac{5}{16}$ in. in diameter and using five concentric wicks. Now kerosene is usually vaporized, and burned under mantles. Acetylene gas is valuable in lighthouse illumination, because of the high intrinsic brilliancy of its flame. Incandescent lamps, which are replacing other light sources, afford a clean and convenient source of light and a wide range in candlepower.

A great variety of lenticular and reflecting apparatus is used, some lenses being almost 9 ft. in diameter. The modern tendency, however, is in the direction of more compact condensing and reflecting apparatus with light sources of greater concentration and higher intrinsic brilliancy. Lights may be continuous or flashing, of the latter the one at Atlantic Highlands, N.J., is well known to vessels entering New York harbor, and can be seen for many miles at sea.

H. D. K.

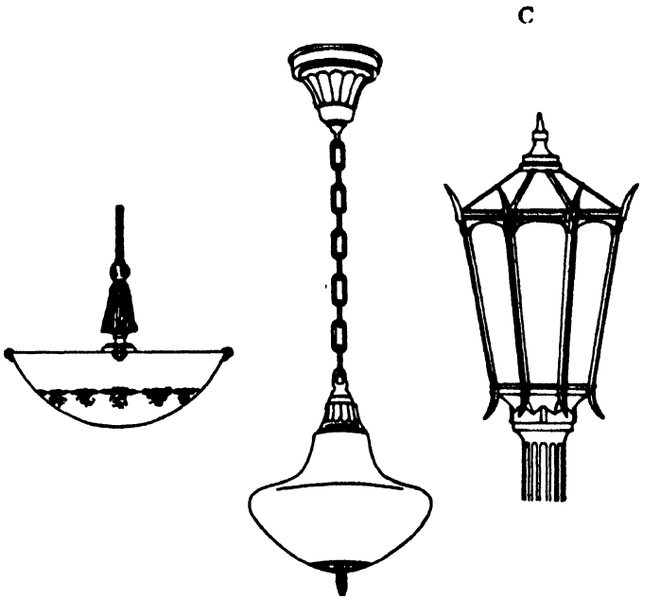
LIGHTING. *See* ILLUMINATION, ARTIFICIAL; NATURAL LIGHTING; GAS LIGHTING; NATURAL LIGHTING; UNDERWATER LIGHTING; ELECTRIC LAMPS.

LIGHTING, AIRWAYS. *See* AIRWAYS.

LIGHTING, STAGE. *See* STAGE LIGHTING.

LIGHTING FIXTURES. *See* LUMINAIRES.

LIGHTING GLASSWARE, glass illuminating appliances, including ornamental glass shades, diffusing enclosing globes, glass panels, and semi-direct bowls, examples of which are shown in the illustration.



COURTESY WESTINGHOUSE LAMP CO.

LIGHTING GLASSWARE

A, *Semi-indirect bowl;* B, *enclosing globe;* C, *street lantern*

Other types of glass for accurate light control are prismatic refractors and reflectors, mirrored glass reflectors and lenses.

LIGHTNING, the flash of light that accompanies the violent discharge of electricity in the atmosphere. The spark may pass between two clouds or between a cloud and the earth, the difference in electric-potential being of the order of a thousand million volts, about 3,000,000 volts per meter. The quantity of electricity discharged in lightning has been estimated at about 30 coulombs. Since the average duration of the flash is about 1/1,000 second, the average strength of the current corresponds to about 30,000 amperes; the energy involved is several thousand kilowatt hours.

The first flash, which breaks down the electrical resistance of the air, is instantaneous; but the air then immediately becomes ionized and a conductor, and thereafter the flash advances in stages, so to speak. It appears that the discharge goes from positively charged clouds to negatively charged ones, and when the lightning is "forked" it branches away from the positive charge; which since the earth is considered negatively charged is in agreement with the observed fact that the forked end of a flash points down.

Forked lightning and similar linear forms of lightning are often called chain lightning, as contrasted to sheet lightning, which is merely the observed glow on the clouds, produced by flashes of lightning that are themselves invisible. Ball lightning is an infrequent form, appearing as a small spherical mass of light, slowly moving through the air as if it were constantly producing its own electrical field; it usually explodes but does comparatively little damage.

Thunder and lightning are nowadays considered to be secondary happenings of a thunderstorm of which the rainfall is the primary phenomenon. For a discussion of its causes, *see* THUNDER. Another of its incidental occurrences, as well as from ATMOSPHERIC ELECTRICITY in general, is St. Elmo's Fire.

The electric discharge taking place between a cloud and the surface of the earth may cause death to living beings and destruction through fire to inanimate objects. The dangers are minimized by the use of lightning conductors which form a through metallic connection between the ground and high, protruding points, which are always most likely to be struck by lightning since at those points the difference in potential with the surrounding air is greatest.

W. J. L.

LIGHTNING ARRESTER, a device which offers high RESISTANCE, or insulation, to normal electric currents in a power-transmission line or ANTENNA but which permits abnormally large charges due to lightning to leak off rapidly to the ground. A simple form, consisting chiefly of two points separated by a short air gap, is commonly connected between an ANTENNA and the ground. If the antenna becomes heavily charged due to electrical storms, leakage can take place across the gap.

LIGHTNING CONDUCTOR, or lightning rod, a device of any form installed to protect a building from lightning. The usual form is a pointed rod attached to the roof and well grounded by means of a conducting cable. The points produce a stream of ionized air (*see* IONIZATION) which virtually extends the conductor to a considerable height. The lightning cloud then discharges through this stream and the grounded conductor.

LIGHTNING PROTECTION, in electrical transmission, the grounding of unusual, momentary waves of electrical energy, or "surges," due to LIGHTNING strokes in order to prevent damage to the lines or to connected apparatus. Lightning strokes on transmission lines may be considerably reduced by placing one or more ground wires above the power wires. To protect apparatus, LIGHTNING ARRESTERS are connected from the line to ground near the apparatus. The lightning arrester lets the surges due to abnormal voltage pass, but suppresses any power current. Common types are oxide-film, thyrite, and autovalve. The theoretical aspects of lightning protection are subjects of much controversy and extensive research is being carried out to determine the best methods of preventing damage by lightning. Adequate means of protection is important, since "outages" or time lost due to lightning damage cost public utilities thousands of dollars annually.

C. L. D.

LIGHT PROJECTION, the direction of light, usually in a concentrated beam, to a given point or area. It may be accomplished by reflectors, lenses, or a combination of the two.

In projection by reflectors, the paraboloidal reflector is most widely used. It has the property of projecting the rays from a light source placed at its focal point in a beam of substantially parallel rays. In HEADLIGHTS and floodlights, the beam is frequently spread horizontally by means of a fluted lens placed in front of the reflector. In the simplest lens projector a plano-convex lens, of as short a focal length as possible so as to bring the light source near and intercept the greatest angle of flux, is used. The lens method of projection is widely used in motion picture and stereopticon projection. Frequently, a spherical mirror is placed behind the light source. *See also* SEARCHLIGHT.

H. S. B.

LIGHTSHIP. This term has two meanings, first, when applied to a ship that is floating high out of water, at a water line that is considerably below the Plimsol or freeboard mark (*see* FREEBOARD) and second, to a specially designed vessel that is permanently anchored near a reef or shoal water to warn navigators.

Lightships are staunchly built of steel, with one or two masts for carrying the light or lights, some having Diesel engines installed for propulsion if necessary, living quarters for several men and besides the lights are equipped with fog signals and sometimes with submarine oscillators.

Among the well known lightships are Fire Island, anchored off Fire Island, L.I., N.Y., Nantucket off the Island of Nantucket, and Northeast at the northeast entrance to Delaware Bay.

LIGHT SIGNALS, usually, beams of light, either clear or colored, used to convey intelligence. Their most familiar forms are LIGHTHOUSES and buoys for marine navigation, block and switch signals for railway traffic and the familiar red, amber and green signals for automobile traffic. The lights may either burn continuously and convey their message by their color or location, or they may flash a code. The color code in universal use for railway and highway traffic is: red to indicate danger, stop; amber or orange to indicate caution, slow; green to indicate clear, proceed.

Aviation beacons provide a clear beam rotating six times per minute directed slightly above the horizontal so that it can be seen by aviators approaching from any direction. Each rotating beacon is accompanied by two "on course" beacons pointing in opposite directions along the airway. These beams are red to indicate the absence of an emergency landing field or green to indicate one nearby, and flash in Morse code the number of the beacon.

LIGHT YEAR, the distance traveled in one year by a ray of light which has a speed of 186,284 miles per second. It is equal to 5,880,000,000,000 miles.

LIGNITE, called also BROWN COAL because of its usual color, the next stage after PEAT in coal formation. The weight of sediments accumulated above the vegetable deposits of swamp or lake compresses them. This combined with the heating effect of pressure drives off an increasing amount of the volatile matter, such as carbon dioxide, water and methane or marsh gas. The material progressively loses its resemblance to plant remains and becomes more solid,

compact and homogeneous, with a mounting content of carbon. The process eventually transforms peat into lignite, then ANTHRACITE coal, and sometimes GRAPHITE.

Lignite is chocolate brown to black in color, with a dull, soft appearance. It is non-coking and burns with a smoky flame giving moderate heat; it will not stand handling in transportation. Lignite is a distinctly low-grade but inexpensive fuel and, though the most abundant American fuel, is used only locally and in relatively small quantities. Extensive fields of lignite are found in the Rocky Mountain regions and in the Dakotas, also in Europe, particularly Germany and France. Jet, used in jewelry, is a hard, black form of lignite or brown coal.

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LIGNUM-VITÆ (*Guaiacum officinale*), a handsome tree of the caltrop family native to the West Indies and the northern coast of South America. It grows 20 to 30 ft. high with numerous branches bearing opposite pinnate leaves and pale blue flowers in axillary clusters. The extremely hard wood, so heavy that it sinks in water, is exported from Jamaica, St. Domingo and the Bahamas. It is used for pulleys, mallets, and other objects requiring extreme hardness. A balsamic resin, gum guaiacum, used in medicine, is obtained from the wood.

LIGUESTE, PIERRE LACLEDE (1724-78), American trader and pioneer, also known as Pierre Ligueste Laclede, was born in Bion, France, in 1724. He emigrated to New Orleans, and led an expedition, which set out in 1763 to promote the fur trade west of the Mississippi River. The chief trading-post established by this company grew into the city of St. Louis. Ligueste organized the Louisiana Fur Company and amassed a large fortune by trade with the Indians. He died on the Mississippi River, June 20, 1778.

LIGUORI, ALFONSO MARIA DEI, ST. (1696-1787), Doctor of the Church of Rome and founder of the Liguorian Order, was born at Marienella near Naples, Sept. 27, 1696, of noble family. He commenced his career in the profession of law, but in 1726 was ordained a priest. Liguori founded the Order of REDEMPTORISTS or Liguorians in 1732 and commenced to write those works of morality and casuistry for which he is famous. His best-known works are the *Glories of Mary* (1750), a work on devotional theology; and *Homo Apostolicus* (1755), a treatise on moral theology. In morality he steered a middle course between the "rigorists" and the "laxists," and his writings are much admired for their sanity and moderation. He died at Nocera, Italy, in 1787 and was canonized in 1839. In 1871 Pius IX conferred on Liguori the title Doctor of the Church.

LIGURIAN, an extinct wide-spread INDO-EUROPEAN linguistic family centering in northern Italy, but known only from brief inscriptions in Venetic and Lepontine, possibly in Pre-Sabellian and Siculian, and, in proper names Rhaetic. It belonged to the *centum*-group (*see* CENTUM LANGUAGES) and appears to have stood linguistically midway between Italic and Celtic. *See* separate articles on these languages.

LIGURIAN REPUBLIC. Bonaparte in his first Italian Campaign of 1796 established the Ligurian Republic in place of Genoa as a means of securing both money for the government of the Directory in France and power for himself in Italy. The Genoese government was already torn by factional strife during the early months of Bonaparte's conquest of Italy, and was hopelessly attempting to maintain neutrality. In the course of these internal quarrels some French citizens were slain, which gave Bonaparte the opportunity he desired to dictate his terms. The Doge and the Senate of Genoa were unable to offer resistance and on June 6, a provisional treaty was signed at Montebello—where Bonaparte held his court—by which the rule of the nobles in Genoa was replaced by a limited democracy, with a popularly elected two-chamber legislature and an executive composed of a Doge and 12 Senators. The Republic was given the classical name *Ligurian* in accordance with those ideas current in France connecting republican with Roman tradition.

LI HUNG-CHANG (1823-1901), Chinese statesman, was born in Anhwei province, Feb. 16, 1823, and early reached the highest ranks in the examinations for official position. He played a prominent part in the suppression of the Taiping Rebellion, but his most important work was in the field of the modernization of China. He started the first modern cotton mills in China in 1888, brought about the organization of the first and most important Chinese steamship company in 1872, built the first railway in 1880, except for a short line at Shanghai which was torn up, and in many other ways pressed insistently and actively for the introduction of western technical improvements into China. In this he had to fight against vigorous opposition from conservatives at the Imperial Court. He also took a prominent part in China's diplomacy. After serving as China's representative in the negotiations of the Shimonoseki Treaty, which ended the Sino-Japanese War, 1894-95, he secured agreements with Russia which brought that country into Manchuria, as an offset, in Li's view, to Japanese expansion. He visited the United States in the 1890's, and represented China in the negotiations following the Boxer Uprising of 1900. Li Hung-Chang was China's greatest statesman of the latter half of the 19th century. He died in Peking, Nov. 7, 1901.

LIKIN, the Chinese tax collected on goods passing from one district to another. The imposition of this tax started as a means of raising revenue for the Imperial Government at the time of the Taiping Rebellion, 1850-64, and at first the tax was collected only on goods passing from one province to another. The collection of such transit taxes continued after the rebellion was suppressed because they proved an important revenue source. In recent years, the *likin* collections have been taken almost entirely by local authorities, and transit taxes, many not called *likin,*

have come to be imposed on goods passing boundaries of areas smaller than provinces. The question of the abolition of *likin* figured prominently in the international discussions of China's right to tariff autonomy. Attempts to abolish *likin* by governments of the Republic have met with small success partly because the income from *likin* collections is an important part of provincial revenues and partly because the central government could not enforce its orders for the abolition of the tax.

LILAC, a genus (*Syringa*) of handsome shrubs and small trees of the olive family. There are about 30 species, native to the Old World, many of which are highly prized as ornamentals. They are mostly large hardy shrubs, bearing opposite entire leaves and showy panicles of lilac, purple or white, often fragrant flowers. The common lilac (*S. vulgaris*), native to eastern Europe and western Asia, much planted in various forms, is one of the most popular ornamental shrubs in cultivation. It bears in May or early June a profusion of pink-purple or white, highly fragrant flowers in large oblong clusters. The Persian lilac (*S. persica*), a smaller, later-blooming shrub, native to western Asia, usually with whitish flowers, is also extensively planted.

LILIENTHAL, OTTO (1848-96), German aeronautical engineer, born at Anklam, Prussia, May 23, 1848. Educated in Berlin as a mechanical engineer, in 1880 he established himself as a manufacturer of some of his own patents. He studied the problem of equilibrium by observation of the flight of birds, upon which he based his construction of gliders. Lilienthal demonstrated the superiority of curved airplane wings. He made several thousand gliding flights and was killed in 1896 in one of his experiments. He was the author of *Der Vogelflug als Grundlage der Fliegekunst.*

LILITH, a female nocturnal demon, or night-monster, mentioned in Isaiah 34:14. The name Lilith seems to be derived from the Semitic root from which comes the Hebrew word *layil,* "night." The Assyrian demon Lilit is often spoken of as a goddess of the night. In cuneiform inscriptions Lilith is the name of one of the demons of the storm.

Later tradition, however, with its characteristic fullness of detail and imaginative powers, regarded Lilith as having been a demon of the night who pursued men and children. She was pictured as a seductive woman with long hair, and as wandering about at night, attaching herself to any person who was sleeping alone in a room. During the Middle Ages, Lilith, among the mystics, became a nocturnal demon who stole among children in the form of a night-owl, and who killed all illegitimate children. Others pictured her as eager to seize new-born children and carry them off; for this reason both mother and child wore amulets to protect themselves from her. Again, she was regarded as the original or first wife of Adam, whom he had married before the creation of Eve. Lilith is not mentioned in the Biblical story of the creation (Genesis 1-2) or in the story of the Garden of Eden (Genesis 3). She is purely a superstitious figment of the ancients' imagination and fears.

A. SH.

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LILLE or **L'ISLE, ALAIN DE** (c. 1128-c. 1203), a French Cistercian monk who lived near Montpellier during the 12th century. He later removed to the abbey of Citeaux and took his name from Lille in Flanders. He belongs to the Summists, but is best known for his poem, *De Planctu Naturae,* and a treatise on human vices. Of considerable importance also is his treatise against heretics. Besides these works he left a poem entitled *Anti-claudianus.* Alain de Lille died in 1203.

LILLE, capital of the department of the Nord, the chief linen center of France, and the industrial metropolis of the northeastern coal field. Flax spinning is an industrial specialty and lisle thread takes its name from the city. Cotton spinning and the manufacture of linen and woolen cloth are extensively carried on. Other manufactures include engines, tobacco, and chemical products. Formerly the capital of French Flanders, Lille is now the capital of the department of the Nord. As an old citadel it is regarded as VAUBAN's masterpiece. PASTEUR was a professor in the university. Occupied by the Germans from Oct. 1914 until Oct. 1918, Lille suffered severely during the World War. Pop. 1931, 201,568.

LILLIPUT, in Swift's GULLIVER'S TRAVELS, the fantastic kingdom of the Lilliputians, an imaginary race of pygmies. On the first of his four extraordinary voyages, Gulliver was shipwrecked on the shores of this strange land. He was a source of the utmost terror to the Lilliputians, who were only a few inches high; but gradually Gulliver won their confidence and discovered all the ingenious workings of their society.



LILY
Lilium formosum

LILY or **LILYE, WILLIAM** (c. 1468-1522), English scholar and grammarian was born at Odiham, Hampshire, about 1468. He engaged in classical studies in Italy under Sulpicius, Pomponius, Laetus and Egnatius, and is believed to have been the first teacher of Greek in London. In 1510 he was appointed first high master of the new St. Paul's School. Lily is famous as one of the authors of the *Brevissima Institutio,* or the Old Eton Grammar, compiled by Colet, Erasmus and Lily. He died of the plague in London, Feb. 25, 1522.

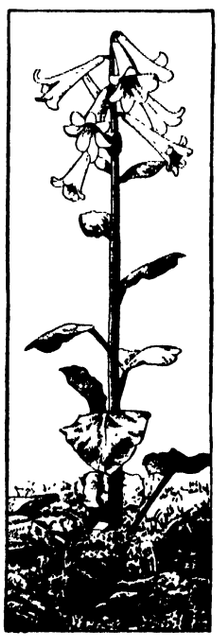
LILY, the typical genus (*Lilium*) of the lily family. The lilies are herbaceous perennials, char-

acterized by scaly bulbs, unbranched, usually leafy stems and solitary or variously grouped funnel-shaped or bell-like flowers. Although botanists have described more than 300 species, this number should be reduced to about 75. In America their distribution extends from southern Canada to Florida and from coast to coast, with several handsome species in California; in Europe their range is from Scandinavia and mid-Russia to the Mediterranean region; and in Asia, from Siberia to the mountains of India, with numerous beautiful species in China and Japan. Some lilies grow in dry, open fields, poor soil and full sunlight; others in moist, shady glades and rich forest mold; a few, in swamps.



TIGER LILY
Lilium. tigrinum. Double flower

About 60 species are suitable for outdoor gardening and a few for greenhouse culture. In America lilies have been largely neglected as garden plants, mainly because of the erroneous belief that they are difficult to grow. This is true of some species when their special requirements are ignored, but such varieties are relatively few and unimportant. The majority are sturdy, long lived, adaptable to a wide range of conditions and suited to general culture. Yet, in spite of their beauty they are unrepresented in many gardens. At least 40 kinds of lilies are suitable for gardens in the temperate zones. Among them are: Caucasian lily (*Lilium monadelphum*), Martagon (*L. martagon*), orange (*L. croceum*), madonna (*L. candidum*), candlestick (*L. dauricum*), Hanson (*L. hansoni*), Nankeen (*L. testaceum*), western orange cup (*L. umbellatum*), Canada (*L. canadensis*), coral (*L. tenuifolium*), wood (*L. philadelphicum*), leopard (*L. pardalinum*), royal (*L. regale*), goldband (*L. auratum*), tiger (*L. tigrinum*), speciosum (*L. speciosum*), Henry (*L. henryi*), American Turk's cap (*L. superbum*).

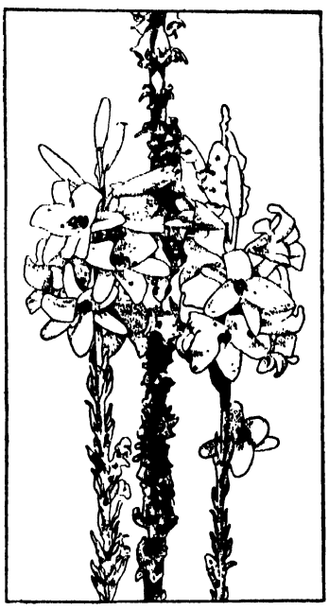


HIMALAYAN LILY
Lilium giganteum himalaicum

Some of these are suitable for planting in perennial borders; others among low shrubbery, above the branches of which their branches may extend; still others for rock gardens, naturalistic plantings, or for massing in beds. Most lilies are excellent as cut flowers because of their lasting qualities.

Large quantities of bulbs are still collected from wild sources but the principal species are also propagated extensively in Japan, California, and Bermuda. Wild bulbs are believed to be more robust and healthy than cultivated ones, but this is not fully proved. American grown bulbs reach the market earlier and usually in better condition than those from Europe and still better and earlier than those from Japan. Because of their scaly nature the bulbs are subject to injury by drying; hence the sooner they can be planted after being dug the better.

Although some species thrive in heavy soils, even in clay, the majority prefer light loams well supplied with humus. Moisture must be maintained during active growth either by cultivation or mulching or, during dry periods, by soaking the soil weekly to the depth of a foot. Good drainage is imperative with all but the Canada and the American Turk's cap species which naturally grow in wet ground.



MADONNA LILY
Lilium candidum

Lime acts as a poison to most lilies and must be avoided either in natural soil or as applications of lime. Of the list given above, the following do not suffer from lime in moderate amounts: tiger, madonna, candlestick, Henry, Martagon, western orange, Hanson, Caucasian, and Nankeen. These should be chosen for planting when the only available soil is limy. Otherwise the ground should be acidified by an application of crude aluminum sulphate at the rate of one pound to the square yard, applied on the surface and slowly washed into the ground by several hours of gentle sprinkling. M. G. K.

LILY-OF-THE-VALLEY (*Convallaria majalis*), a small perennial of the lily family, widely grown in gardens for its dainty early-blooming flowers. It grows in woods widely throughout Europe and Asia from Great Britain to Japan, and also in the higher mountains of Virginia and the Carolinas. The plant, which rises 4 to 9 in. high from a deep rootstock, bears two oblong basal leaves and a narrow one-sided cluster of fragrant, nodding white flowers. Numerous varieties are used by florists for bouquets and other decorations. All parts of the plant contain convalarin, a poisonous glucoside used in medicine.



LILY-OF-THE-VALLEY

LILY-WHITE REPUBLICANS, in the southern states, that faction of the Republican party which excludes Negro voters from its local and state organiza-

tion, and does not solicit their support for its candidates. *See* BLACK AND TAN REPUBLICANS.

LIMA, the political and commercial capital of PERU, situated on the Rimac River, 8 mi. from its port, CALLAO. Lima is a picturesque city of commercial importance. The great cathedral is called the finest in South America. There are numerous churches, fine plazas, excellent shops on narrow streets, a university, a museum, theaters and the second largest bull ring in the world. The principal manufacturing establishments are cotton factories, woolen mills, distilleries, flour mills, chocolate, shoe and tobacco factories. At Lima is the central university of Peru, the University of San Marcos, which was founded by Charles V in 1551 and re-chartered in 1928.

After the overthrow of the Incas it was at once seen that the seat of the new government would have to be removed from the inland capital, Cuzco, to some point on the seaboard affording easy communication with the metropolis. The most favorable site seemed to be at the mouth of the River Rimac. Here was the seaport of Callao, which now became the outlet of the new capital, Lima, founded in 1535 by Pizarro. In anticipation of a greatness destined never to be realized, Lima, or the *City of Kings,* as it was called, was planned and laid out on a large scale. Est. pop., 1927, 250,000.

LIMA, a city of western Ohio, the county seat of Allen Co., situated on the Ottawa River, about 75 mi. southwest of Toledo and 70 mi. north of Dayton. The transportation facilities include the Pennsylvania, Baltimore and Ohio, Detroit, Toledo and Ironton, Nickel Plate and the Erie railroads and bus lines. The city is in an agricultural region, which is largely given over to dairy farming and hog-raising, and is also in the heart of the northwestern Ohio oil fields and natural gas belt. Refining of petroleum oil is a leading industry. Among the manufactures are locomotives, steel castings and automobile trucks. In 1929 the value of the factory output was about $29,600,000; the retail trade amounted to $26,728,358. There is an extensive wholesale and jobbing trade. Lima owns and operates its water works. The Ohio Hospital for the Criminal Insane is located nearby. Lima was laid out in 1831 and 11 years later became a city. Pop. 1920, 41,326; 1930, 42,287.

LIMAÇON, a curve discovered by Etienne Pascal, father of BLAISE PASCAL. Its Cartesian equation is $(x^2 + y^2 - ax)^2 = b^2(x^2 + y^2)$ and its polar equation is $r = a + b\cos\phi$. It is one of the curves that can be used in trisecting an angle. *See* CURVES; TRISECTION OF AN ANGLE.

LIMANTOUR, JOSE IVES (1854-), a Mexican statesman and financial expert. He served for a number of years as Under-Secretary of Treasury in the Cabinet of President Porfirio Diaz, and in 1893 became Secretary of Treasury. He promulgated a number of reforms, among them the abolition of the *alcabala* (sales tax). His policy stimulated commerce and increased exports some 15 times during his administration. At the time of the Revolution in 1911 he fled to Europe where he lives to-day.

LIMBER, a framework mounted on an axle and wheels forming the front part of a gun carriage. In front is a pole for attaching horses or a tractor; in rear a hook, pintle, to which the gun is connected. An ammunition chest is found on limbers of light guns. *See also* ARTILLERY.

LIMBO. 1. In Catholic theology, a term (usually written *limbus*) used to denote the outer rim or border of Hell. It is the abode of those (chiefly children) who, having died uncleansed of original sin, deserve neither the joys of heaven nor the tortures of Hell. First defined by St. Thomas Aquinas in the 13th century, the term became well-known through Dante's *Divine Comedy.* 2. A place to which worthless objects are relegated. 3. The name sometimes given to a prison.

LIME, a small tree (*Citrus aurantifolia*) of the rue family, native to the Malay Archipelago, India and Ceylon, widely cultivated for its small globular fruit in warm countries throughout the world. The West Indies have long been famous for their lime juice and citric acid which are largely used by mariners to prevent scurvy. These islands, the southern tip of Florida, and the Keys supply the American market with fresh fruit which is used to make limeade and to flavor candy and other confections. Limes are little grown in California. The trees are more sensitive to cold than other citrous fruits mainly because warm periods in the winter often start sappy growths which freeze during subsequent cold snaps. Until recently they were grown from seed or cuttings but desirable varieties are now propagated by budding. General care of orchards is the same as for other citrous trees. The fruit is gathered when mature but still green, packed in barrels and shipped without processing like lemons. The sweet lime (*C. Limetta*), thought to be a hybrid with some other citrous fruit, has not become commercially important. A hybrid between the lime and the kumquat (*Fortunella margarita*), called limequat, promises because of its hardiness to be of commercial importance. M. G. K.

LIME, commonly known as the calcination product of LIMESTONE, under which classification may be grouped pure calcium limestone and also magnesium calcium limestones. Together with these, lime is produced in lesser amounts from crystallized limestone and from shells. The CALCINATION is accomplished by burning in cylindrical upright apparatus, ranging from crude pot kilns to highly developed vertical kilns (*see* KILNS). In some parts of the world the burning of the stone is still accomplished by the crude method of building very hot fires in contact with a limestone wall and then chipping off the burned lime.

Lime is universally used as a building material, and until about thirty years ago was prepared by slaking burned lime with water, then made into a putty and the desired ingredients added. However, recent developments have introduced scientific meth-

ods of hydrating this burned lime with proper amounts of water, producing a definite compound of constant composition, the combined water varying according to the amount of calcium and magnesium oxides contained in the burned products. Only the calcium oxides hydrate, the magnesium oxides remaining as such in the finished product. Graded according to quality and plasticity, these hydrates are known as masons' and finishing limes.

Northern Ohio has a dolomitic stone peculiarly suited for the manufacture of finishing lime, which is superior to any hydrate for finishing purposes, due to its physical properties. It is characteristic of this stone that a product is made which cannot be duplicated from stone of the same chemical composition from other localities.

The value of lime in the industrial world depends upon its chemical and physical properties, and these qualities can be controlled by modern technical control and plant development.

In Europe much lime is burned in kilns operating with a mixture of fuel and stone. This product is too impure for sale in the United States. In the United States most kilns are vertical, fuel being natural gas, oil, coal, wood, producer gas and latterly coal fed by automatically operated feeders. Certain limes are also burned in rotary kilns.

The scientific development of lime manufacture and plant development has progressed rapidly of late years, along with other major industrial developments. H. W. H.

LIMERICK, an epigrammatic nonsense-verse, unlimited as to its choice of subject, terse and pointed in style, and consisting of two long lines on one rhyme, succeeded by two short lines on another rhyme and ending with a "snapper" rhyming with the first two lines. For example:

"There was a young lady of Lynn,
Who was so excessively thin
That when she essayed
To drink lemonade
She slipped through the straw and fell in."

The limerick is of doubtful origin, and may be from a song in this form, with the word "Limerick" in the refrain. It has been the amusement of many famous men to write limericks, and in the present century limericks have been made especially popular by newspaper and magazine contests.

LIMERICK, the chief town, port and county borough of County Limerick, Irish Free State, lying in lowlands on the broad Shannon River.

Limerick was traditionally founded by the Danes. It is divided into three parts: English town, founded under King John upon King's Island where are the Norman King John's castle, now a barracks, and the Protestant, Early English cathedral of St. Mary; second, Irish Town, and third, Newton Pery, the most modern section. The antiquities include several early churches, a Dominican priory, Whitamore's castle and the stone upon which the Treaty of Limerick was signed in 1691. There are modern administration buildings and a Roman Catholic cathedral. The port, the most important along the west coast, has canal connections inland and a large shipping trade. Local flour mills supply most of western Ireland and Limerick is also the headquarters for valuable fisheries. Pop. 1926, 39,448.

LIMESTONE. The most important and widely distributed of the carbonate rocks, and a common SEDIMENTARY ROCK found all over the world. It consists largely of the mineral CALCITE, calcium carbonate, in varying degrees of purity, and finds extensive application in industry and art. Limestone shows a great range of color, largely due to impurities. It is white when pure, but the common colors are gray, yellow and black, due to such impurities as iron oxide and bituminous or organic matter. Other impurities may give it distinctive character, silica making it harder, clay softer, and magnesium carbonate making it a "dolomitic limestone," or DOLOMITE, often pinkish in color. Limestone is ordinarily compact, and of a smooth granular texture.

Other characteristics serve to distinguish varieties of this rock; when it shows conspicuously its fossiliferous nature it may be named for the chief organic remains, such as crinoidal, shell, coral and FUSULINA LIMESTONE. When composed of spherical grains resembling fish roe, it is known as oolitic limestone and, when coarser, as pisolitic. Coquina means a limestone made of loosely cemented fragments of shells. MARL is a calcareous clay. A soft, fine-grained and pulverulent variety is the common CHALK of commerce. Hydraulic limestone is a clayey variety used in cement-making, and LITHOGRAPHIC STONE is fine-grained and adapted to printing purposes. TRAVERTINE is an irregularly porous limestone deposited by springs and streams, found especially in Italy, and used as a decorative building stone.

The widest use of limestone is as crushed stone for road and ballast material and for making LIME. Some is used for building stone and for statuary, and a considerable amount is used as a flux in blast furnaces. The most popular form for sculpture and as decorative stone is MARBLE, metamorphosed limestone.

Limestone is widely distributed, having been formed in all geological ages. In the United States the most commercially important deposits in 1931 were east of the Mississippi River, especially in Indiana and along the Appalachian Mountains. It also occurs in great quantities in the Mississippi Valley and in the Rocky Mountains. *See also* ALABASTER; TUFA; TRAVERTINE; METAMORPHISM; OOLITE; PETROLOGY; STALAGMITE; STRATIFICATION; SHALE; CLAY; STALACTITE.

S. F. K.

LIMESTONE, NUMMULITIC. *See* NUMMULITIC LIMESTONE.

LIME TREE, a name given, especially in Great Britain, to Old World species of LINDEN (*Tilia*), as the small-leaved lime (*T. cordata*) and the large-leaved lime (*T. platyphyllos*), both fine ornamental trees.

LIMIT, in mathematics, a term indicating a value which a variable may approach indefinitely near without reaching, or may reach without passing. Thus, the limit of $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \cdots$ is 2, for the larger the number of terms, the nearer the sum approaches 2. In the case of a chord of a circle, the superior limit, or the largest it can be, is a diameter, which is the maximum chord, using the term in the ordinary sense. The significance of the term limit, as used in mathematics, is most readily seen by considering a simple numerical case. The value, v, of the repeating decimal fraction 0.333 . . . . depends upon the number (n) of decimal places taken into account. Thus v depends upon n and clearly grows with n. However, v does not grow indefinitely, but approaches closer and closer the fixed value $\frac{1}{3}$. The fixed number $\frac{1}{3}$ is therefore said to be the limit of the variable v.

More generally, if the mode of variation of any variable quantity v is such that values of v keep on approaching a fixed value, a, so that the difference between v and a may become arbitrarily small, then a is said to be the limit of v.

The notion of limit is basic in the CALCULUS.

N. A-C.

LIMITATION, STATUTES OF. Originally a real action to recover property in land was not barred by lapse of time. As to many demands there was a presumption of payment after twenty years. With the development of trade and commerce and rise of an economic order calling for security of acquisitions and security of transactions, limitation of the time within which actions might be brought was an obvious necessity. Hence an English Statute of James I fixed the time within which actions might be brought on the several different types of claim. This statute having been enacted prior to colonization of America is in a sense part of the common law in the United States. But the several states have each their own Statute of Limitations following the general lines of the English Statute. In general the time fixed by the Statute begins to run when the plaintiff's cause of action accrues, and having begun to run is not suspended or interrupted. If, however, at the time the cause of action accrues the person entitled is under disability, as, for instance, in case of a minor or a lunatic, the term of the statute will not begin to run until the disability is terminated. However, in the language of the law, it is not permitted to tack disabilities, that is, if the person to whom a cause of action has accrued is under disability and dies before removal of the disability and his successor in interest is also under disability, the term of the statute will begin to run notwithstanding.

LIMITATION OF ARMAMENTS. *See* ARMAMENTS LIMITATION.

LIMITED LIABILITY, a phrase used in reference to the restriction of or exemption from legal responsibility. Limited liability derives this meaning from common speech rather than from judicial construction or interpretation, since it is descriptive of various types of legal immunity or privilege granted to certain classes of COMMON CARRIERS, particularly railroads and steamships, and also to those engaged in the business of transmitting messages for the public by telephone or telegraph. Corporations engaged in such enterprises may secure limited liability, nonexistent at common law, either by means of statutory enactment or by contracts entered into with their passengers or customers. Under the stringent rule obtaining at common law, a common carrier is deemed the insurer of goods or baggage carried for compensation which were damaged or lost in transit. For instance, the carrier is responsible according to this principle, even though the damage sustained by a passenger in the loss of his baggage was caused through no demonstrable negligence of the carrier. In many states carriers may avoid such broad responsibility by entering into reasonable contracts with passengers, whereby their liability to payment of damages is limited to a specific maximum amount. Contracts providing immunity for willful wrongdoing and negligence are universally considered unreasonable. The terms of such contracts are frequently printed on transportation tickets sold to passengers, who, in purchasing the tickets, bind themselves by the contracts.

Development of transportation by aircraft has raised numerous problems in the application of the law. For travel by air passengers purchase tickets which may contain printed provisions releasing the operating company from all liability for the injury or death of the passenger during the trip. C. F. WE.

LIMNOS. *See* LEMNOS.

LIMOGES, a city of south central France situated on the bank of the Vienne, and celebrated since the Middle Ages for its porcelain and its enamel work. Large quantities of the former are exported to America. The enameler's art reached its height in the 16th century, later declined, and was again revived after 1875. Limoges, as the capital of the department of the Haute-Vienne, has flourishing industries of shoemaking, distilling, and printing. A settlement of both Gauls and Romans, Limoges became the capital of the medieval province of the Limousin and was much fought over during the English wars. It retains some of its picturesque old streets and buildings, and has a 13th-century bridge built on Roman foundations. Pop. 1931, 92,577.

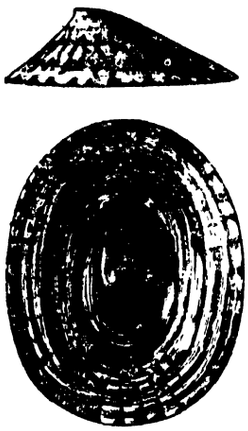
LIMON, a port of the east coast of Costa Rica, situated about 80 mi. east of San José. Vessels sailing between England and the United States stop here. The chief industry is exporting bananas, produced in the surrounding district. A large fruit company has offices and storehouses here, loading ships according to modern methods. Est. pop. 1930, 15,831.

LIMONITE, a yellow, hydrous iron oxide, or common rust, used as an ORE of iron and for OCHER pigment. It ranges in color from yellow to nearly black, and occurs massive, earthy, concretionary and in stalactitic and mamillary forms with varnish-like surface. Limonite is a secondary mineral, formed by WEATHERING of other iron compounds. It is found in small

masses, as a stain or as a cement in many rocks. Soils are commonly yellow because of its presence. Frequently the oxidized zones of ORE DEPOSITS contain it in large quantities, and the weathering of ferruginous rocks may produce residual, minable deposits of limonite. Bog-iron ore is a porous, earthy form found sometimes in lakes and swamps.

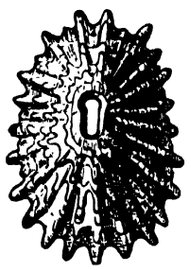
As an ore of iron, limonite ranks next to HEMATITE. The southeastern States of the United States are important producers, as are Germany, Scotland and Sweden. Limonite is derived from the Greek word for meadow. *See also* ORE DEPOSITS; GOSSAN; SANDSTONE; SIDERITE.

LIMPET, strictly, the popular name for members of a family (*Patellidae*) of sea snails, or shell-bearing marine gastropods. There are many species of limpets, all of which live on rocky coasts between the tide marks.



COMMON LIMPET

The limpets have conical shells, quite unlike the usual spiral-twisted snail shell, and these are often brilliantly colored. The animals fix themselves to the rocks by a powerful, adherent foot. Their hold is so strong that they cannot be dislodged by the heaviest sea, nor pried loose unless enough force is applied to break their shells, except when they are caught off guard. While the tide is out they remain fixed tightly in one place, keeping sufficient moisture under their shells to last until they are again under water. Only then do they move about, for they cannot endure exposure to the air. Sometimes they live in definite spots on the rock, which become hollowed out so that they exactly fit the shape of the shells, and the animals are said to be able to find their way home from a distance of three feet.



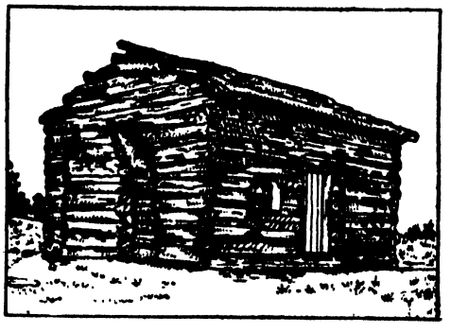
KEYHOLE LIMPET
Fissurella nodosa

The members of several closely related and very similar sea snail families are also called limpets, the most important being the *Acmaeidae,* to which the circum-polar species (*Acmæa testudinalis*) common in New England belongs; the keyhole limpets (*Fissurellidae*); the ear-limpets or abalones (*Haliotidae*); and the slipper-limpets (*Calyptraeidae*). *See also* ABALONE; MOLLUSKS.

LIMPOPO, a river of South Africa, rising in northern Transvaal, and after a course of nearly 1,000 mi., emptying into the Indian Ocean. The Olifant is its chief tributary. Although the mouth is obstructed by a sand bar, thus rendering the river unimportant commercially, the Limpopo can be navigated for almost 100 mi.

LINACRE, THOMAS (1460-1524), English humanist and physician, was probably born at Canterbury. He studied at Oxford, continuing his work in Italy under brilliant teachers, taking the degree of doctor of medicine at Padua. He was appointed King's physician to Henry VIII and had among his patients the great statesmen of prelates of his court. In 1520 he was ordained priest and retired from active life. He is noted especially for his grammatic works, and for his foundations of lectures on medicine at Oxford and Cambridge and for his Latin versions of Galen's contributions. He died on October 20, 1524.

LINCOLN, ABRAHAM (1809-65), 16th President of the United States, born in Hardin (now Larue) Co., Ky., Feb. 12, 1809; died in Washington, D.C., Apr. 15, 1865. He was a product of the pioneer



LOG CABIN BIRTHPLACE OF ABRAHAM LINCOLN IN LARUE COUNTY, KENTUCKY

wave that swept westward in the settling of the midwestern states which, during his lifetime, grew to an economic and political status that shaped historic events. He was a wilderness child, born in a clay-floor cabin that had a "stick and clay" chimney, no windows and one door. He went barefoot in summer and wore deerskin moccasins in winter. On his ancestry and early life, the most significant data is that contained in an autobiographical sketch which Lincoln wrote in 1860 for the use of John L. Scripps in preparing a campaign biography. In these notes, he says that his father, Thomas, and grandfather, Abraham, were born in Rockingham County, Va., whither their ancestors had come from Berks Co., Pa. "The family were originally Quakers, though in later times they have fallen away from the peculiar habits of that people." Abraham, the grandfather, was killed in an Indian fight about 1784, leaving a widow, three sons, and two daughters. "Thomas, the youngest son, by the death of his father, and very narrow circumstances of his mother, even in childhood was a wandering laboring-boy, and grew literally without education. He never did more in the way of writing than to bunglingly write his own name. Before he was grown he passed one year as a hired hand with his uncle Isaac on Wautauga, a branch of the Holston River. Getting back into Kentucky, and having reached his 28th year, he married Nancy Hanks—mother of the present subject—in the year 1806. She also was born in Virginia; and relatives of hers of the name of Hanks, and of other names, now reside in

Coles, in Macon and in Adams counties, Illinois, and also in Iowa." Such is the sparse personal testimony of Lincoln as to his ancestral backgrounds. Since his 1860 autobiographical notes, the evidence has become formidable that the Lincoln line from which he descended included prosperous Quaker farmers in Pennsylvania, a governor of Massachusetts and other exceptional men, while his mother, Nancy Hanks, was an extraordinarily vivid and capable woman. Also, the formerly accepted view that Lincoln's father, Thomas, was a shiftless no-good, has changed on evidence that he was a skilled cabinet maker, was a road commissioner in one Kentucky township, held positions in the Baptist Church, paid taxes, debts, made purchases showing he was not one of the "mudsocks" and was more than ordinarily responsible and capable among men.

The Lincoln family, in 1816, moved from Kentucky into southern Indiana, settling near Gentryville, Spencer Co. According to Lincoln's notes, the removal "was partly on account of slavery, but chiefly on account of the difficulty in land titles in Kentucky." He also noted that they settled in "an unbroken forest, and the clearing away of surplus wood was the great task ahead." From then on for years he knew the ax. "Abraham, though very young, was large for his age, and had an ax put into his hands at once; and from that till within his twenty-third year he was almost constantly handling that most useful instrument less, of course, in plowing and harvesting seasons." Lincoln's mother died in 1818 and was buried near a salt lick where wild deer came often. A year and two months later, his father went to Kentucky and married a widow, Sarah Bush, who came with her three children to the Indiana homestead. This step-mother proved a guide and a mainstay for the growing boy; he often spoke in later years of the close bond between them. His Indiana education he summarized: "While here, Abraham went to ABC schools by littles, kept successively by Andrew Crawford, ——Sweeney and Azel W. Dorsey." His total of school attendance was perhaps three months. Then, and later in Illinois, he learned grammar, history and surveying from books, alone, often by candle or wood-fire light. As a boy and youth, he read and re-read the family Bible, *Aesop's Fables, Robinson Crusoe, Pilgrim's Progress, Weem's Life of Washington,* the *Revised Statutes of Indiana.* He husked corn for the loan of the one book, walked 18 miles for the loan of another. He wrote verses and lampoons and took part in debating society programs —and was, besides, a runner, weight lifter, wrestler and athlete of more than local reputation.

The Lincoln family moved to Illinois in 1830 with their household belongings on a home-hewn ox-wagon. At 21 years of age Lincoln left the family homestead at Goose Nest Prairie in Coles Co. and went to Sangamon Co., where, at New Salem, he did for Denton Offut what he had done for another storekeeper in Indiana—helped him build a flatboat, load it with produce, and float it down to New Orleans, selling the produce and returning north by horse or steamboat. At New Salem, he studied law, spent part of the year of 1832 as the elected captain of an infantry company which marched to northern Illinois in the Black Hawk War, courted Ann Rutledge and sat at her bedside while she was dying. As a storekeeper in New Salem, he acquired the stocks of other bankrupts, and, in the end, suffered a total loss himself, with debts on his hands that it took him 15 worrying years to pay off. In 1834, he was elected a Whig member of the Illinois legislature, and re-elected two more terms. Among outstanding points in his legislative record were leadership in changing the state capital from Vandalia to Springfield, and the co-signing with Dan Stone of a protest against resolutions adopted by the Illinois General Assembly, in which resolutions was a declaration that "the right of property in slaves is sacred to the slave-holding states under the Federal Constitution." Lincoln and Stone agreed with their pro-slavery colleagues that abolition agitation tended "rather to increase than to abate" the evils of slavery, but they chose to go on record as demurring to their colleagues becoming openly pro-slavery in a free-soil state.

His first law partnership was with John T. Stuart, Whig Congressman, his second, with Stephen T. Logan. In 1843, and for 18 years thereafter, he was the senior partner with William H. Herndon, a temperamental, picturesque anti-slavery philosopher. Election to Congress came in 1846, with a majority of 1,511 votes over the Democrat candidate, Peter Cartwright, a circuit-riding Methodist preacher. Though voting for every measure of supply and care for the soldiers in the Mexican War, he pressed resolutions aimed to force President Polk to bring out the documents which would reveal the precise "spot" where Mexican troops had invaded the soil of the United States. He voted for a declaration that the war was "unnecessarily and unconstitutionally commenced by the President." He lost ground at home, did not run for re-election, settled down to law practice and said he was through with politics.

As a lawyer he slowly and steadily across twenty years moved to a place of leadership in the state bar. During most of these years he practiced on the Eighth Circuit, a group of counties visited yearly by a judge and attorneys who set up court and disposed of litigation. Lincoln's practice ranged from a comic $3.00 hog case and the dramatic Armstrong murder trial, to important cases for the Rock Island Railway, the Illinois Central Railway, and the McCormick Harvester Reaper Company.

During the years of law practice and politics in Illinois, he met at close hand and came to know in degrees of intimacy a number of remarkable men, a peculiarly American breed which had to do with his personal development. They included David Davis, a millionaire landholder and judge of the courts of the Eighth Circuit; Stephen A. Douglas, a United States Senator, a magnetic, dynamic figure who strode the national stage almost with the power of an

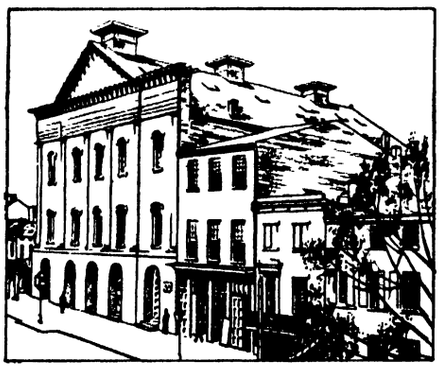
Andrew Jackson; and extraordinary personalities such as Leonard Sweet, Lyman Trumbull, Edward D. Baker, Isaac Funk, Richard Oglesby, Jacob Bunn, Milton Hay, Ward Hill Lamon, Henry C. Whitney, Richard Yates and Orville Browning, each of them a reckonable contact and influence. Lincoln's own autobiographical notes give a whimsical view of his personal development, and his willingness that others should know of it. "Abraham now thinks that the aggregate of all his schooling did not amount to one year. He was never in a college or academy as a student and never inside of a college or academy building till he had a law license. What he has in the way of education he has picked up. After he was twenty-three and had separated from his father, he studied English grammar—imperfectly, of course, but so as to speak and write as well as he now does. He studied and nearly mastered the six books of Euclid since he was a member of Congress. He regrets his want of education and does what he can to supply the want."

He was almost 6 ft. 4 in. in height. He walked with an easy saunter and spoke in a voice of rather high tenor and of unusual carrying power when he was aroused. His odd looks, his sense of humor, his story-telling and his dealings that won for him the nickname of "Honest Abe" were all traits that operated to make him a political asset to the new Republican party, organized in 1854 following the repeal of the MISSOURI COMPROMISE. In 1856, there were 110 ballots at the national Republican convention for Lincoln to be the candidate for Vice-president with John C. Fremont, who headed the ticket. Two years later, he made a speech to the Republican State Convention in Illinois and gave out words that went far and wide, words that had the simple and enigmatic sound of terrible prophecy. "A house divided against itself cannot stand. I believe this Government cannot endure permanently half slave and half free. I do not expect the Union to be dissolved—I do not expect the house to fall—but I do expect it will cease to be divided. It will become all one thing or all the other. Either the opponents of slavery will arrest the further spread of it, and place it where the public mind shall rest in the belief that it is in course of ultimate extinction; or its advocates will push it forward, till it shall become alike lawful in all the states, old as well as new—North as well as South." Now came the famous debates with Senator Douglas at seven different places in Illinois before immense crowds. Lincoln lost in this race for the senatorship. He had, however, presented the country with a statement of issues and an argument against the compromises of the Democratic party, which made him a "dark horse" candidate for the Republican presidential nomination in 1860. The Chicago national convention of the party in that year found him the most available candidate. After a campaign in which Lincoln stayed in Springfield and said in effect that the time had come for him to say nothing, he was elected. The vote was 1,866,452 for Lincoln, 1,375,157 for Douglas, 847,953 for Breckenridge, southern wing of the Democratic party, and 590,631 for Bell, Constitutional party. Lincoln was inaugurated March 4, 1861, as a "minority President," with South Carolina, Georgia, Alabama, Florida, Mississippi, Louisiana and Texas seceded from the Union by legislative action, with troops mobilized and the *Charleston Mercury* publishing items of northern information under the heading of "Foreign News."

Upon Lincoln's acquisition of power as President he became one of those rare makers of history, moulding events as well as being moulded by them. From then on, his personal, official story saturates the decisive events; his biography is, in a sense, the narrative of most of the humanly controlled moments of the four years in which he headed and directed the war of the Northern and Border States against Southern secession and independence. Large and formidable volumes must be consulted to get an understanding of what happened and what might have happened in the course that Lincoln followed with reference to the bombardment of Fort Sumter which opened the war, of his negotiations with the Border States by which Kentucky and Missouri were held and Virginia lost to the Union cause, of his devices by which a Cabinet was held together for good service, of his trial of one general after another till he found ULYSSES S. GRANT as the man for General-in-Chief, of his political manipulations toward reelection in 1864, of his maneuvers which resulted in first a tentative and then a permanent Emancipation Proclamation on the ground of "military necessity," setting millions of slaves free in territory not yet occupied or controlled by his armies, of his efforts which went on incessantly during four years to bring about "compensated abolishment" or the liberation of the negro slaves by direct purchase on the part of the Federal Government. He moved with shifting, tumultuous events, a paradox and a riddle, once saying to a secretary, "My policy is to have no policy." Amid hot clamor as to why the war was being fought, he told the country, "My paramount object is to save the Union, and not either to save or destroy slavery. If I could save the Union without freeing any slave, I would do it; if I could save it by freeing all the slaves, I would do it; and if I could do it by freeing some and leaving others alone, I would also do that." To this one issue he held fast. The testimony among friends and enemies of Lincoln is almost overwhelming that his was, for good or bad results, the master mind of a revolution or crisis in which vast, trampling armies from the North overthrew the planter aristocracy of the South, laid waste wide areas, wiped out slave property valued at three billions of dollars, and decreed that for the long future the free, wage, labor system should prevail from coast to coast in a nation where the separate states were to be under the final dominion of one federal government.

The idea of the Union was to Lincoln sublime, touching the mystical in its portents. The peculiar

tenacity of the Lincoln legend and tradition (more than 4,000 books, large and small, have been written about him) and his adoption by many peoples over the earth as one of their own heroes trace to his personality and to issues that center in him. He had personality with the tragic and comic elements marvelously mixed. His life and utterances are taken by many the world over as the best personal key to the operation of "the American experiment" or to the mysteries of democracy and popular government. All of the drama that attached to his rising from the lowliest of the working class to authoritative power where he "struck the shackles from three million



FORD'S THEATRE, WHERE ABRAHAM LINCOLN WAS ASSASSINATED

slaves" was intensified by his assassination as he sat in a box at Ford's Theater in Washington on April 15, 1865.

When he declared the war to be for the Union first of all and against slavery secondarily, he added, "I intend no modification of my oft-expressed personal wish that all men everywhere could be free." When he delivered his second inaugural address, he stressed the bitter and strange paradoxes of the war, how neither party expected it to be so bloody nor to go so long, how the cause of the war (which was rooted in the legalized institution of slavery) came to an end while the war raged on and how each side had expected an early triumph. He declared, "Both read the same Bible and pray to the same God; and each invokes his aid against the other. It may seem strange that any men should dare to ask a just God's assistance in wringing their bread from the sweat of other men's faces; but let us judge not that we be not judged. The prayers of both could not be answered—that of neither has been answered fully." With his sudden death it was known, as was noted later by Jefferson Davis, who had been President of the Confederate States of America, that there was lost a powerful personal force for reconciliation and solidarity in the reconstruction of the South.

He married, in 1842, Mary Todd, nine years his junior, daughter of Robert S. Todd, banker and manufacturer of Lexington, Kentucky. She bore him four sons: Robert Todd, who died in 1926; Edward Baker, who died in infancy; William Wallace, who died in the White House in 1862; and Thomas, nicknamed "Tad," who died in 1872. On the inside of the wedding ring that Lincoln gave his wife was the inscription, "Love is eternal." She was, in the main, a help and an impetus to him, though difficulties were frequent. He had a saying he quoted from his father, "If you make a bad bargain hug it all the tighter." In the year 1873 she was, on petition of her son, Robert Todd, tried in the probate court of Cook Co., Ill., by a jury of prominent citizens, entirely sympathetic to her, was declared mentally unsound, and her estate was placed under a conservator. A year later, she was declared of sound mind and spent the larger part of her remaining life, until she died in 1882, in Europe. C. S.

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LINCOLN, JOSEPH CROSBY (1870-), American author, was born in Brewster, Mass., Feb. 13, 1870. He studied in Boston to be an artist but found writing a more congenial occupation and after 1899 devoted his time to it. His novels deal chiefly with New England characters, and include *Cy Whittaker's Place,* 1908, *The Portygee, Galusha the Magnificent, Queer Judson, Silas Bradford's Boy,* 1928, and *Blowing Clear,* 1930. Lincoln is also the author of many short stories and of *Cape Cod Ballads,* 1902. On several works he collaborated with his son, Joseph Freeman Lincoln.

LINCOLN, ROBERT TODD (1843-1926), American lawyer and eldest son of Abraham Lincoln, was born at Springfield, Ill., Aug. 1, 1843. He entered Harvard Law School in 1864, but discontinued his studies to join the staff of Gen. Grant. After the Civil War he resumed his studies, and began practice in Chicago, Ill., in 1867. Lincoln was Secretary of War in 1881-85. He was asked to become a candidate for the Presidency, but declined to oppose the nomination of Chester A. Arthur. He was appointed minister to Great Britain in 1889, and after serving four years returned to Chicago to become counsel for the Pullman Company. He became president and in 1911 chairman of the board of that organization. He died at Manchester, Vt., July 25, 1926.

LINCOLN, a parliamentary, municipal and county borough of Lincolnshire, England, situated upon a hillock near the Witham and at the outskirts of the Fen district, 130 mi. northwest of London. Since Romano-British times it has been one of the most important of English cities, although suffering during the Danish and Norman invasions.

Built of the peculiar stone of Lincoln Heath and Haydor, the great cathedral or minster is 481 ft. long, 223 ft. wide at the transepts and 81 ft. high. It contains portions of two earlier Norman cathedrals. The first of these, founded by Bishop Remigius in 1086, was restored by Bishop Alexander after a fire in 1141; the second or restored cathedral was seriously damaged by an earthquake in 1185. The present cathedral may thus be dated from 1186,

the year in which Bishop Hugh of Avalon, "St. Hugh of Lincoln," built the present Early English choir and transepts. The nave, western transepts and decagonal chapter house were completed by 1250. The celebrated presbytery or Angel Choir was built in 1258-79. The lower part of the Central Tower, 271 ft. high and containing the 5-ton bell, "Great Tom of Lincoln," was built in the Early English style about 1250; the upper portion, in Late Decorated, dates from 1307-20. The west windows and the chapels attached to the presbytery, in Perpendicular Gothic, are of the 15th century.



LINCOLN CATHEDRAL VIEWED FROM THE SOUTHEAST

The grandeur of Lincoln Cathedral is impressed upon one at first sight of the elaborate Early English west front, built about 1225, above which the two great western towers rise to a height of 206 ft. Of comparable beauty is the Early English southwest porch or galilee. There are two superb rose windows; that of the north transept, in Early English, containing 13th century glass, and that of the south transept, a masterpiece in the Decorated style. But the outstanding single feature of the cathedral is undoubtedly the Angel Choir, which is so named from the angels carved on the spandrels of the triforium.

Among the notable adjuncts of the cathedral are the old Bishop's Palace (12th century), the cloisters (13th century), the Exchequer Gate (14th century) and the library, built by Wren (17th century).

Lincoln is rich in old buildings, among them the Church of St. Mary-le-Wigford with a Saxon tower; an old timbered priory; the 12th century Jew's House, one of the oldest in Britain; and Newport Arch, the ancient north gate of Lindum, one of the outstanding examples of Roman architecture in England. The High Bridge (1160) over the Witham still retains a row of timbered houses upon it. During the World War tanks were manufactured at Lincoln, and to-day it is becoming increasingly important as an engineering and machine-manufacturing center. Pop. 1921, 66,042; 1931, 66,246.

LINCOLN, a city of central Illinois, the county seat of Logan Co., situated between Salt and Sugar creeks, 30 mi. northeast of Springfield. An electric line and the Chicago and Alton and the Illinois Central railroads afford transportation. Lincoln is in a grain-growing region. It has a casket factory, a dress factory, a poultry-packing plant, large greenhouses specializing in rose culture, and other industries. In 1929 the manufactures were valued approximately at $1,600,000; the retail trade amounted to $6,059,062. Near by are sand and gravel pits. Among local institutions are Lincoln Junior College, a State institution for feeble-minded children and the Illinois Odd Fellows' Orphans' Home. Close by are the Lincoln lakes. Lincoln was settled in 1819 and named for Abraham Lincoln who frequently visited the city and practised law in the local courthouse; in 1929 this courthouse was removed by Henry Ford to Dearborn, Mich. The city was incorporated in 1865. Pop. 1920, 11,882; 1930, 12,855.

LINCOLN, the capital of Nebraska and the county seat of Lancaster Co., situated on Salt Creek, in the southeastern part of the state. Five trunk lines and 18 branch line railroads afford transportation. Page Airport is situated immediately south of the city. Lincoln is situated in a clay basin containing salt deposits, but surrounding this area is an unusually fertile agricultural region, devoted chiefly to grain raising and dairying. The city is an important trade center and shipping point for the crops and live stock of this district. Important local industries include the manufacture and assembling of farm implements, gasoline engines and airplanes; and the city has also flour mills, meat-packing and woodworking establishments, creameries, planing mills, brickyards and printing presses. In 1929 the manufactures were approximately $22,000,000; the retail trade amounted to $51,040,666.

Lincoln is the seat of the University of Nebraska, Cotner College, Nebraska Wesleyan University and Union College. In 1931 a United States Veterans Hospital was opened here. The magnificent new capitol, begun after designs by Bertram G. Goodhue, is an outstanding architectural achievement, built at a cost of approximately $10,000,000.

Lincoln was built on the site of a village known till 1867 as Lancaster. The State had made tests in the locality, hoping to discover extensive salt deposits, but the search failed. The site however was chosen for the capital and renamed Lincoln. Material was hauled 60 mi. by team for the building of the first capitol. Lincoln was incorporated in 1869 and by 1877 had become a city of the first class. It was the home of William Jennings Bryan, who published here his journal, *The Commoner.* In 1930 the city annexed the suburb of Havelock (pop. 1930, 3,659). Pop. 1920, 54,948; 1930, 75,933.

LINCOLN, a town of northern Rhode Island, in Providence Co., about 4 mi. north of Pawtucket. The manufacture and preparation of cotton cloth is the leading local industry. Lincoln Reservation, an extensive park, is located here. Pop. 1920, 9,543; 1930, 10,421.

LINCOLN-DOUGLAS DEBATES, the series of seven public debates in Illinois towns between ABRAHAM LINCOLN, Republican candidate for the Senate, and his Democratic opponent STEPHEN A. DOUGLAS, 1858. These joint meetings were proposed by Lincoln, confident of his untried strength as a popular speaker; but Douglas defended his views with great ability, and the debates assumed the importance of a national forum on POPULAR SOVEREIGNTY, and the status of slavery in the territories. Lincoln, although losing the election, became a nationally eminent Republican, whereas Douglas, enunciating the FREEPORT DOCTRINE in the course of the debates, confirmed southern Democrats in their opposition to his can-

didacy for the Democratic presidential nomination in 1860.

LINCOLN HIGHWAY, a national automobile road of the United States extending from coast to coast with New York and San Francisco as terminals. As a memorial to Abraham Lincoln it was planned and begun in 1913 to provide a connected, improved transcontinental highway open to lawful traffic of all descriptions without toll charges. The course was laid out so as to serve the greatest proportion of the people. It is 3,384 mi. long and crosses twelve states: New Jersey, New York, Pennsylvania, Ohio, Indiana, Illinois, Iowa, Nebraska, Wyoming, Utah, Nevada and California. At frequent intervals it is designated by a red, white and blue marker with a blue "L" on the white stripe.

Various types of construction have been used, including concrete, brick, macadam and graded gravel, and up to 1928 almost a hundred million dollars has been spent for this improvement. At that time the road had been completed except for a short stretch through the desert country of Utah which is naturally passable most of the year.

This highway traverses prairie, desert and mountain country. From Omaha westward it follows the Platte River valley along the historic Overland Trail used in the pioneer days by emigrant wagons, stagecoaches and the Pony Express.

The important stations along its route are: New York City; Philadelphia and Pittsburgh, Pa.; Mansfield and Akron, Ohio; South Bend, Ind.; Chicago and Dixon, Ill.; Cedar Rapids and Council Bluffs, Iowa; Omaha and North Platte, Nebr.; Cheyenne and Rock Springs, Wyo.; Salt Lake City, Utah; Reno and Carson City, Nev.; Sacramento and San Francisco, Calif.

LINCOLN MEMORIAL, was erected by the United States in memory of Abraham Lincoln in the western section of Potomac Park, Washington, D.C. It was dedicated on May 30, 1922 with great ceremony, President Harding and Chief Justice Taft being among the speakers. The memorial is an imposing white Colorado marble structure of classic architecture. It stands high on a series of terraces; the first, 1,000 ft. in diameter, supports a stone terrace wall; three marble terraces like a stairway rise from this, the last forming the base for the 13 columns, emblematic of the original states, which are topped by the main structure.

The memorial was constructed from the design of Henry A. Bacon at a cost of $2,000,000. The base is 188 ft. long by 118 ft. wide. An outside Doric colonnade, symbolizing the states in the union when Lincoln died, surrounds the wall of the Memorial Hall. The interior is divided into a central hall and two side halls. Colored marbles line the floor and ceiling. Facing toward the Capitol in the center of the hall is the large, seated statue of Lincoln by Daniel Chester French, measuring 19 ft. from the pedestal. In the side halls are bronze tablets reproducing the Gettysburg and Second Inaugural addresses. Filling the remaining wall space are 2 murals by Jules Guerin, commemorating the abolition of slavery and the reunion of the states.

LINCOLN'S BIRTHPLACE, a national monument, situated 3 mi. southwest of Hodgenville, Ky., on the Big South Fork of Nolin's Creek. A tract of 110 acres including part of the original farm and the log cabin in which Abraham Lincoln was born, Feb. 12, 1809 was set aside July 17, 1916 under the administration of the War Department. The cabin itself is now enclosed in a beautiful memorial building and is preserved as a national shrine in honor of the great emancipator. This monument is about 50 mi. almost directly south of Louisville on a U.S. Interstate Highway. The nearest railroad connection is at Hodgenville on the Illinois Central system.

LINCOLN'S INN FIELDS, a large square near the Courts of Justice in London. Laid out in the 17th century by the noted architect, INIGO JONES, and named after Lincoln's Inn, a legal society, the square is surrounded by the Royal College of Surgeons, lawyers' offices, the Sloane Museum and Lincoln's Inn. It was at one time the haunt of thieves and beggars.

LINCOLN TOMB. Abraham Lincoln (1809-65) is buried in Oak Ridge Cemetery, Springfield, Ill. Funds for a monument, designed by Larken G. Mead, were collected immediately after Lincoln's death. In 1871 the body was placed in the crypt of the permanent monument but it was not until 1874 that the construction was finished. Then the body was moved to a sarcophagus in the center of the catacomb. A few days later the formal dedication was made by Governor Oglesby and a speech was delivered by President Grant. The monument of brick, faced with Quincy granite, consists of a podium 72 ft. square and 16 ft. high which enclosed the burial place at the north, now containing the bodies of Mrs. Lincoln, the two sons, and one grandson and a memorial hall at the south, where there is a fine Lincoln collection of more than 26,000 items. An obelisk, 135 ft. high, rises from this base. After an attempted robbery in 1876, the body of Lincoln was moved to a concrete vault beneath the sarcophagus. The monument was re-dedicated by President Hoover in 1931 after restorations were completed.

LIND, JENNY (1820-87), Swedish soprano, was born at Stockholm, Oct. 6, 1820. After studying with Berg and Lindblad she made her operatic début at the age of 18, later studying with MANUEL GARCIA. Her success began with her Berlin concert in 1844, which was followed by a triumphal European tour that came to a climax with her London appearance in 1847. In 1850 she visited the United States where, under the management of P. T. Barnum, she was hailed with widespread enthusiasm. In 1852, while in Boston, she married Otto Goldschmidt, in whose oratorio *Ruth* she made her last public appearance in 1870. She was known internationally as the "Swedish nightingale" because of the extraordinary freshness and flexibility of her voice. She died at Malvern, Nov. 2, 1887.

LINDBERGH, CHARLES AUGUSTUS (1902-), American aviator and writer, was born at Detroit, Mich., Feb. 4, 1902, the son of Charles Augustus Lindbergh, Congressman from Minnesota. He attended the elementary public schools in Washington, was graduated at the High School in Little Falls, Minn., in 1918, and studied mechanical engineering at Wisconsin University from 1920-22. He then enrolled in the Flying School at Lincoln, Neb. Lindbergh enlisted in the U.S. Air Service at Brooks Field, San Antonio, Tex., Mar. 19, 1924, was commissioned second lieutenant in 1925, and later was advanced to colonel. In Nov., 1925, he joined the 110th Squad 25th Div. Mo. Nat. Guards as a first lieutenant, and became a captain in 1926. He entered the U.S. Air Mail Service and piloted his first mail plane from Chicago to St. Louis on Apr. 15, 1926. While flying this route he decided to compete for the Raymond B. Orteig Prize of $25,000, offered to the first pilot to make a New York to Paris non-stop flight, and securing St. Louis backers to finance the venture, ordered his plane, a Ryan monoplane with Wright whirlwind motor, "The Spirit of St. Louis," in Feb., 1927. He left San Diego at 3:55 P.M. (Pacific Time) on May 10, stopped over a day in St. Louis and landed at Curtiss Field, L.I., at 5 P.M., May 12, establishing a record of 21 hrs. 20 min. for a coast to coast flight.

At 7:52 on the morning of May 20, 1927, Lindbergh took off alone on a transatlantic flight from Roosevelt Field, L.I., via Newfoundland, Ireland and England, to Paris, where at 10:02 on the evening of May 21, he glided his plane down on Le Bourget Field, covering a distance of 3,600 mi. in 33½ hrs. The "Lone Eagle," as Lindbergh was soon called, was tendered receptions by the governments at Paris, Brussels and London, receiving the decorations, "Chevalier légion d'honneur," France, "Order of Leopold," Belgium, and "Royal Flying Cross," Great Britain, and was conveyed to the United States on a U.S. Cruiser to receive the official welcome of President Coolidge and the city of Washington on June 11, and of New York City on June 13. He was promoted to a Colonel of Aviation, decorated with the Distinguished Flying Cross, Distinguished Service Cross, The New York Medal of Honor, and besides the Orteig award, received innumerable trophies and tokens of recognition.

Under the auspices of the Daniel Guggenheim Foundation for Promotion of Aeronautics, Lindbergh made a tour which included 78 cities and every state in the Union, lecturing in the interests of aviation. At the invitation of President Calles, of Mexico, he made a non-stop flight from Washington to Mexico City on Dec. 13-14, and later, a good-will tour of Central America, northern South America and the West Indies, visiting six countries and flying 7,860 mi. before returning to St. Louis on Feb. 13, 1928. For this service, he won the soubriquet, "Ambassador of the Air" and was awarded the Woodrow Wilson Medal and $25,000.

Lindbergh then entered the field of commercial aviation as technical advisor to the Transcontinental Air Transport Co. and the Pan-American Airways, completing the surveys for those lines. He inaugurated the mail and passenger service between Mexico City and Texas and piloted the first mail-plane from Miami to Panama and return in 1931.

Lindbergh married Anne Spencer Morrow on May 27, 1929, and she followed her husband into aviation. In 1930 they experimented with speed conditions in high altitude flying and set up a new transcontinental record. At the end of July, 1931, on a vacation trip, the flying Lindberghs made a flight to Japan which yielded valuable data in future routing of mail and passenger air service across the Pacific. They were accorded an official reception in Tokio where the Imperial Aviation Society awarded Lindbergh the "White Medal of Aviation" on Aug. 28, and the Emperor conferred the "Third Order of Merit of Rising Sun" on Sept. 9. Proceeding to China, the Lindberghs began a series of air-surveys to aid the Government of Nanking in flood relief work. Lindbergh was honored with the "First Chinese Medal," awarded for distinguished service in aviation.

Lindbergh received the "Hubbard Medal," National Geographic Society, the "Langley Medal," Smithsonian Institution, and on Aug. 15 was decorated with his country's highest award, the "Congressional Medal of Honor." He was the author of *We*, an autobiography, in 1927, wrote a series of articles for the New York *Times* and contributed to many journals and magazines. His home in Little Falls has become a museum of aviation, the "Spirit of St. Louis" has been preserved in the Smithsonian Institution, and his medals and trophies have formed a permanent collection of the Missouri Historical Society at St. Louis.

On Mar. 1, 1932, Lindbergh's 20-months old son, Charles Augustus, Jr., was kidnapped from his home near Hopewell, N.J., and was the object of a nation-wide search. The child's body was found on May 12 in woods a few miles from the Lindbergh home.

LINDE, CARL, GEHEIMER HOFRAT, RITTER VON (1842-), German technical engineer and inventor of liquefaction of air, born June 11, 1842, in Bernsdorf. After his graduation and a short employment in a Berlin locomotive factory, he became professor of machine construction at the technical high school in Munich. In 1879 Linde established in Wiesbaden a Company for Linde's Ice Machines (Gesellschaft für Linde's Eismaschinen), returning ten years later to Munich. The liquefaction of air and the making of almost pure oxygen are two of his inventions. In 1897 he received the title of nobility.

LINDEN (*Tilia*), a genus of forest trees of the linden family, called also lime and basswood. There are about 30 species widely distributed in north temperate regions except central Asia and western North America. They are mostly medium-sized trees but sometimes grow 130 ft. high, with fibrous inner bark, finely toothed, usually heart-shaped leaves, and small

fragrant, honey-bearing flowers. Several Old World species are highly prized for street planting, two of which, the small-leaved linden (*T. cordata*) and the large-leaved linden (*L. platyphyllos*), are widely grown in the eastern United States. The soft wood is utilized for many purposes. Cordage and coarse textiles are made from the inner bark. The flowers yield lime-flower oil, used in perfumery, and also honey of unsurpassed flavor. The American species are commonly called BASSWOOD.

LINDEN, an industrial city of Union Co., N.J., located on Arthur Kill, 5 mi. south of Newark and adjoining Elizabeth on the north. It is served by the Pennsylvania, Central of New Jersey and Baltimore & Ohio railroads. Both the Lincoln Highway and New Jersey Route 25, the "Super highway," pass through it. Its industries include the manufacture of dyes, cyanamide and gypsum blocks and the refining and storage of petroleum; one of the largest refineries in the world is located here. In 1929 the manufactures reached approximately $125,000,000. The retail trade in 1929 amounted to $4,925,779. It is the eastern terminus of many oil pipe line systems, some extending as far west as Oklahoma and Texas. It received its charter as a city in 1925. Pop. 1920, 8,368; 1930, 21,206.

LINDENTHAL, GUSTAV (1850-), American engineer, was born at Brunn, Austria, May 21, 1850, and educated at Brunn and Vienna. In 1874 he came to the United States where he was engineer for the Centennial Exposition, Philadelphia, Pa., in 1874-77, and in 1877-90 consulting engineer in the construction of railroads in the West. He settled in 1890 in New York City where he was consulting engineer in the construction of the Pennsylvania Railroad tunnels under the Hudson and East rivers serving in a like capacity in the building of the Hellgate steel arch-bridge over the East River in 1912-17.

LINDISFARNE or **HOLY ISLAND,** an island in the North Sea, lying about 2 mi. off the English coast. Due to the number of springs on the southern part of the island, the inhabitants raise a large quantity of truck-garden products. The northern part of the island is overrun with rabbits which are sold on the mainland. The ruins of a fortress dating from the 16th century prove attractive to tourists who are able to reach the island at low tide by car over the hard-packed sands. Lindisfarne has an area of about 1,050 acres.

LINDLEY, ERNEST HIRAM (1869-), American educator, was born in Paoli, Ind., Oct. 2, 1869. After graduating in 1894 at the University of Indiana, he studied at the universities of Jena, Leipzig and Heidelberg. In 1898 Lindley returned to the University of Indiana as associate professor of philosophy. In 1902 he became a full professor and served as such until 1917 when he was elected president of the University of Idaho. After three years he became chancellor of the University of Kansas.

LINDSAY (LYNDESAY or **LYNDSAY), SIR DAVID** (1490-1555), Scottish poet, was born at Garmylton, Haddingtonshire, Scotland, in 1490. A student called David Lindsay was enrolled at the College of St. Salvator, St. Andrews, in 1508-09, but cannot surely be identified with the poet, who by 1508 was equerry at court and usher to Prince James. In 1528 he became chief herald, and was sent by James V on several diplomatic missions. Despite his official posts he satirized the church, the court and the king unsparingly. Among his works are *The Dreme,* an allegory, *Squyer Meldrum, The Monarche,* and *Ane Satyre of the Thrie Estaitis,* a morality play which had considerable influence on the drama. Lindsay died in 1555.

LINDSAY, NICHOLAS VACHEL (1879-1931), American poet, was born in Springfield, Ill., Nov. 10, 1879. He was educated at Hiram College, Ohio, and later studied art in New York. From 1905 to 1910 he lectured for the Y.M.C.A. and the Anti-Saloon League, and tramped through the South and Southwest, distributing his rhymes and speaking in behalf of "the gospel of beauty." His poetry has had great popularity, particularly *Gen. William Booth Enters Heaven,* 1913, *The Congo,* 1914, and *Johnny Appleseed and Other Poems for Children,* 1928. In 1925 his collected poems, illustrated by himself, were published, and in 1930 *Selected Poems* appeared. Lindsay died at Springfield, Dec. 5, 1931.

LINDSAY, a town and the capital of Victoria Co., a port of entry of Ontario, Canada, situated on the Scugog River, 57 mi. northeast of Toronto. The Canadian National and Canadian Pacific railroads and steamboat connections over the Trent canal system afford transportation to manufacturing and trade. The city is a gateway to the famous Kawartha Lakes, a popular resort region. Considerable manufactures include flour from the wheat of the surrounding agricultural district, woolens, lumber, agricultural implements, spun brass, tanning and boat building. Pop. 1921, 7,620; 1931, 7,505.

LINDSEY, BENJAMIN BARR (1869-), American judge and publicist, was born at Jackson, Tenn., Nov. 25, 1869. He studied in the public schools of Jackson and at South Bend, Ind. At 18 he began work in a real estate office in Denver, Colo., and read law in his spare moments. As a result of these studies, he was admitted to the Colorado bar in 1894. He became deeply interested in the problem of juvenile delinquency, and worked energetically for the establishment of a juvenile court in Denver designed solely for child offenders. He was appointed judge of this court in 1900 and served till 1927, when he lost party support. He used his influence in the following causes: reform of the registration law; reform of the ballot; provision for the care of dependents of state prisoners; liberalization of the probation period of prisoners; and the furtherance of the fresh-air movement in Denver, including the institution of parks and playgrounds. Wide publicity was given to his views on the morals of modern youth. In Dec. 1930 his outbreak against Bishop Manning in the Cathedral of St. John the Divine in New York led to

police court proceedings, which were, however, soon dropped. In 1925 Judge Lindsey published *The Revolt of Modern Youth,* and in 1927 *Companionate Marriage.*

LINE, a geometric figure thought of as a path of a moving point. There are straight lines, curve or



CLASSIFICATION OF LINES
(A) *Straight,* (B) *curved,* (C) *broken and* (D) *mixed*

curved lines, broken lines and mixed lines, the latter term not being commonly used.

LINE DRAWING, a method of drawing an object or figure by means of straight lines, curved lines and cross hatching, with a pen, pencil or steel point used for etching and engraving. Line drawing dates from primitive man who drew symbols to communicate his ideas; it may have taken the place of spoken language, and until a comparatively recent date it was the only form of written language. The term line drawing is now used to define drawings where the contour of the figure is represented, in contradistinction to wash drawings. When the term "line" is applied to paintings or colored drawings the word refers to design. One authority on drawing states that "when I speak of outline I mean all that depicts form without tone," and shows how by varying the quality of the line the contour of a figure, or the outline of an object, can convey solidity, without shading.

LINE ENGRAVING. *See* REPRODUCTIVE ENGRAVING.

LINE LOSS. *See* ALTERNATING CURRENT.

LINEN. Linen is made from the fiber of the flax plant (*see* FIBER PLANTS) which has been cultivated for the purpose for upwards of 7,000 years. The fiber is located around the woody pith of the stem, to which it is attached by a gummy compound which is rendered soluble by a process of steeping known as retting. In a single flax stem there may be 25,000 individual flax fibers, averaging one-thousandth of an inch in diameter, and the de-pithed or scutched flax reaches the spinner in the form of strands up to 42 ins. long.

After a preliminary mill process of hand combing, the flax is passed through a hackling machine which cleans and parallelizes the fibers by automatically passing them through a series of combs graduated from coarse to fine. Later the flax is converted into a continuous ribbon on a spreader machine and passes through a series of three or four drawing frames which comb, parallelize and attenuate this endless band which is known as rove when it is finally loosely twisted and wound upon bobbins in the roving frame. The short fibers termed tow, which are produced in hackling and scutching, are made into a ribbon upon a card, the subsequent processes being similar to those described above.

Flax may be spun wet, half-wet or dry, the finest yarns being produced by the first-named method where hot water is used to draw out the ultimate fibers. Dry spinning yields a soft full yarn and half-wet spinning a smoother yarn.

Linen is built up of two sets of threads called warp and filling which are interlaced upon the loom. Plain linen is formed by the warp and filling threads crossing each other at right-angles and passing over and under each other alternately. A pattern is produced on DAMASKS by means of a Jacquard machine which brings the warp and filling to the surface as desired, the figure effect being produced by a combination of masses of warp predominating, contrasted with masses of filling predominating. Linen is still bleached (*see* BLEACHING) by subjecting it to sun, air and washing, but the modern and more rapid process is to whiten the fabric by repeated scouring with alkaline liquids and weak acids. Linen is given a glossy finish by mangling, beetling and calendering under pressure. Linen piece goods are generally dyed (*see* DYEING) in a jig, the cloth in its full width being reeled through boiling dye liquor. C. R. C.

BIBLIOGRAPHY.—H. R. Carter, *The Bleaching, Dyeing and Finishing of Flax, Hemp and Jute Yarns and Fabrics;* T. Woodhouse and T. Milne, *Jute and Linen Weaving.*

LINER. *See* SHIPS, TYPES OF.

LINESHAFT, the main shaft in a shop or department from which individual machines are driven by BELTS and PULLEYS. Formerly lineshafts were long and were the main method of distributing power, but this system has been made absolute in many shops by the substitution of an individual electric motor on each machine. In other shops shorter lineshafts now drive groups of machines. The cost of lineshafts, their maintenance and the power they consume in FRICTION makes them uneconomical. *See also* SHAFT, DRIVING.

LINES OF FORCE. *See* MAGNETISM.

LINE SPECTRUM. Light passing through a PRISM or DIFFRACTION GRATING becomes thereby spread out into a series of component colors called a spectrum. If the source of light is an incandescent gas in an atomic state (*see* ATOM), the spectrum consists of a series of lines, and is therefore called a line spectrum (for a discussion of the spectrum of a gas in a molecular state *see* BAND SPECTRUM).

For an EMISSION SPECTRUM these lines are bright against a dark background, the colors of the lines depending upon the position in the spectrum. For an ABSORPTION SPECTRUM these lines are dark against the bright background furnished by a continuous spectrum. The positions of the lines in the spectra are the same in either case for a given gas similarly excited.

It is found that spectral lines are always arranged in groups or series. The lines of such a series which represent the longest WAVE-LENGTHS, are usually the brightest, and the intensity steadily decreases with decreasing wave-length. The successive lines are progressively closer together as they become weaker, becoming infinitely weak and infinitely close together

at a certain wave-length, called the convergence wave-length of that series.

The individual lines in spectral series are usually not single lines, but are often found to consist of two or more components. Such lines are said to possess a *multiplet* structure, and are found most commonly in spectral series of chemical elements having the higher ATOMIC WEIGHTS.

Even the individual members of a multiplet type of spectral line sometimes exhibit traces of subdivision. This is termed *hyperfine* structure. This hyperfine structure becomes evident only under the most powerful spectroscopic instruments (*see* SPECTROSCOPE) and taxes the performance of even those instruments to the utmost. Present knowledge of hyperfine structure is therefore tentative and incomplete.

An entirely different type of fine structure appears when the incandescent gas which is a source of a line spectrum is placed either in an intense magnetic field or in an intense electric field. The former is termed the *Zeeman Effect* (*see* MAGNETO-OPTICS), the latter the STARK EFFECT. Both effects are accompanied by polarization of the components of the lines thus split up.

The fact that every gas exhibits a characteristic spectrum is used to very good effect in qualitative chemical analysis. Within certain limits it may also be used in quantitative analysis. The method depends upon the fact that certain sensitive, or "ultimate," spectral lines disappear last with increasing dilution of the element whose presence is being investigated.

Much of the effort of modern SPECTROSCOPY is given to using the data furnished by line spectra to yield information about the structure of atoms. One of the early discoveries was that light producing a line spectrum originates in individual atoms of the gaseous source. The fact that each gas exhibited its characteristic spectrum indicated a definite structure peculiar to the atom of that gas. Moreover, the large numbers of lines in the spectra of some of the gases indicated that the structure of each atom of these gases was complicated. Before the development of our present knowledge of the structure of atoms, Rowland, one of the early spectroscopists, is said to have remarked that the iron atom must be far more complex than a grand piano. Subsequent developments have more than justified this opinion. It is in the study of line spectra, in fact, that most of the present concepts of the structure of atoms have originated.

The first major step in this direction was taken by Niels Bohr of Copenhagen in 1913, who developed a theory of the origin of the spectral lines of HYDROGEN. Hydrogen having the lightest and simplest of the atoms, and the series relations for the hydrogen spectrum being both simple and well known, it was natural that the first development of an atomic-structure basis for spectroscopic theory should have occurred in connection with hydrogen. Bohr assumed, following Rutherford, that the hydrogen atom consisted of a single ELECTRON revolving around a PROTON in a circular orbit. He also assumed that the angular momentum of the electron could change only by multiples of Planck's Constant. This amounted to assuming that only certain sized orbits are possible. His third assumption was that radiation occurred only when the electron passed from one to another of these possible orbits. Finally, he assumed that the difference between the total energies of the atom before and after the passage of an electron between orbits represented the energy radiated and that this energy could be represented by the product, Planck's Constant $\times$ Frequency, the frequency being the number of waves per second streaming out of the radiating atom. The third and fourth assumptions constituted Bohr's principal contribution to the theory that bears his name. The agreement between Bohr's Theory and experimental data on the line spectrum of hydrogen was so striking as to secure instant and favorable world-wide attention for the theory. Certain refinements were soon introduced by Arnold Sommerfeld of Munich which extended Bohr's Theory.

In spite of its points of excellence, the Bohr-Sommerfeld Theory quickly outlived its usefulness, though its imagery and notation has been largely used by succeeding theories. The inadequacy of the Bohr Theory lay primarily in the fact that it applied only to hydrogen. All attempts to extend it to the line spectra of the heavier atoms were fruitless. The energy levels formerly associated with such orbits now possess the field in their own right. The lineal descendant of the Bohr Theory appears to be the so-called vector model of the atom. The revulsion against Bohr's mechanical picture has not been so strong but that the vector model makes very effective use of a vector representation of orbital angular momenta and of the spin of electrons within radiating atoms. The strength of the vector model lies in its retention of some vestige of a mechanical picture, together with its frankly empirical approach to the spectroscopic problems with which it deals.

The last word in spectroscopic theory is the so-called "quantum mechanics." It furnishes a theoretical foundation for many spectroscopic effects which cannot be otherwise treated. It is so highly mathematical, however, and so completely devoid of visual imagery that it will be long before it can be generally regarded by the non-technical world as a satisfying description of the sub-atomic basis of spectroscopic phenomena. *See also* QUANTUM THEORY. L. W. T.

LING (*Molva molva*), a deep water fish of the cod family (*Gadidae*), found in northern European seas, is the object of an important food fishery. It has an elongate, grayish body, from 3 to 5 feet long, weighing as much as 65 lbs. The ling attacks and devours other fishes in large numbers and is greatly aided by strongly pointed teeth. Living usually in rocky territory, it comes inshore in the June spawning season, often to a river mouth, where it deposits its eggs in the mud. An American fish (*Lota maculosa*), common in the Great Lakes is also called ling.

LINGUA FRANCA, a term applied to numerous types of jargons employed as a means of commercial

intercourse between foreigners and natives, and spoken over wide areas both in the Old and New Worlds. The lexical basis is usually taken from one language and mixed with a large number of corrupted words from as many as two, three and even four others, with almost complete loss of grammatical structure. The *lingua franca* of the Mediterranean area, for instance, also called Sabir, is predominantly Italian with a mixture of French, Spanish, Greek and Arabic; that of the Far East is English (*see* PIDGIN ENGLISH); while the CHINOOK JARGON served the same purpose among North American Indians on the Pacific Coast.

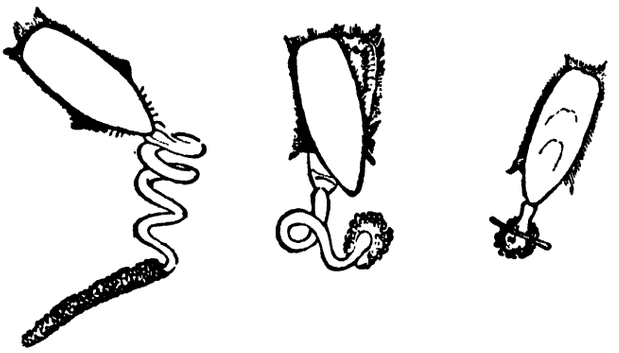
LINGUISTICS, scientific study of the phenomena of language, popularly called comparative philology, though the latter term is best restricted, as in classical philology, to investigation of all intellectual manifestations found in a given language or group of languages, thus including language, literature, religion, political organization, etc. The method of linguistics is essentially historical and comparative, and is rigidly governed throughout by observance of the principle of PHONETIC LAW. It must, moreover, take many other factors into account: the physiology and psychology, both normal and pathological, of all organs concerned with the production and reception of speech; the psychology of the development of ideas of every kind; and all phases of the history of the people or peoples concerned with the linguistic area investigated. It thus renders within the mental sphere of the development of mankind services analogous to those of palaeontology, anthropology, etc., within that of the physical sphere, or of archaeology, etc., within the material sphere.

Linguistics is divisible into five main branches, two essentially physiological and mechanical—PHONOLOGY and morphology (*see* INFLECTION); one historical—ETYMOLOGY; and two primarily psychological—SYNTAX and SEMANTICS. L. H. G.

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LINGULA, the name of a genus of Brachiopods which is famous as a persistently primitive type, and has remained practically the same since Ordovician times. Members of this genus live in the warmer seas, where they usually make burrows for themselves between the tide marks. They have brown or green bivalve shells, which in shape resemble the shells of some bivalve mollusks. A long stalk, which they use to attach themselves to objects on the sea floor, or to the bottoms of their burrows, protrudes from between the valves. Lingula are eaten in parts of Japan and of the Philippines.

LINKAGES, a combination of levers or connecting bars, or of links, cranks or arms, used to secure a desired movement in any mechanism. They multiply or decrease motion, transfer it to another plane, and perform many other intricate actions. They include such devices as levers, cranks, toggle joints, pantagraphs, bell cranks, and their supporting shafts. A pantograph is a linkage such that the moving of one of the points along the lines of a figure causes another point to describe a similar figure, generally larger than the original. One of the most interesting is the Peau-



LINGULA
Glottidia pyramidata

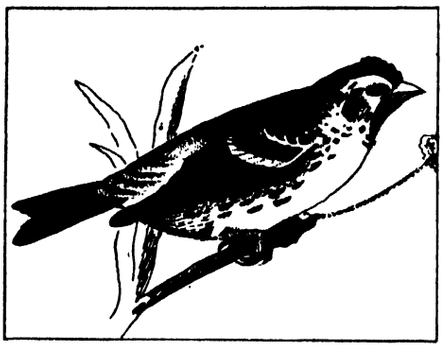
cellier Cell, devised by a French military officer in 1864, the first instrument invented for drawing a straight line without having another one, a ruler, by which to draw it. *See* MATHEMATICAL INSTRUMENTS.

LINKÖPING, a city of Sweden, situated about 100 mi. southwest of Stockholm on the Stångå River, capital of the district of Östergötland. It is the see of a Lutheran bishop and an important military center. There are several notable buildings, among them a cathedral dating from the 12th century, the episcopal palace, the library and the museum. The manufactures of Linköping include hosiery, tobacco and cloth. Pop. 1931, 29,845.

LINNAEUS, CARL, also known as Carl von Linne (1707-78), Swedish botanist, was born May 23, 1707, at Råshult, Sweden. He intended to take holy orders, but a local physician offered to teach him physiology and natural history. While a student at Upsala University, young Linnaeus read a critique which first suggested his artificial system of plant classification. Appointed a lecturer in 1730, he left two years later to explore Lapland, describing his findings in the *Flora Lapponica* (1737). In 1735, Linnaeus settled in the Netherlands, where he studied medicine. In Leiden his epochal *Systema Naturae* was printed, and its lucidity and order attracted immediate attention. After visiting England in 1726, he returned to the Netherlands to publish his *Genera Plantarum,* which laid the foundation of modern botany. After some travel, he returned to Sweden, being appointed in 1741 to the chair of medicine at Upsala, and later to that of botany. In 1753, Linnaeus received the order of the Polar Star and eight years later a patent of nobility. His fame and influence increased the attendance at Upsala, where he enlarged the university collections and started a museum. Among his more important publications are *Flora Suecica* and *Fauna Suecica,* voluminous observations covering 15 years; *Hortus Upsaliensis, Philosopha Botanica; Species Plantarum.* Brilliant both as a scientist and an organizer of material, he con-

veyed his enthusiasm to his students. His personal collections and books became the property of the Linnean Society of London. Linnaeus died of apoplexy Jan. 10, 1778, and was buried in Upsala Cathedral.

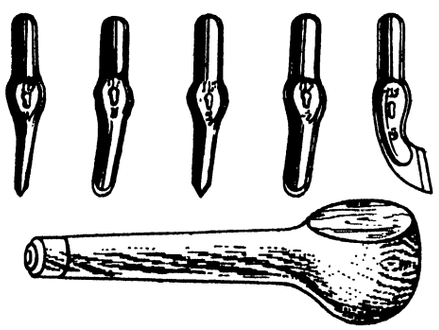
LINNET, a small song bird (*Linota cannabina*) of the FINCH family (*Fringillidæ*), widespread in the north temperate parts of the Old World. It is slightly



LINNET

smaller than the English sparrow, with plumage varying with the sex and season from gray to brown and red. In summer the male has a rosy-red crown and breast. The linnet nests in bushes near the ground, laying as many as six light blue eggs marked with reddish or brown, and feeds upon seeds, especially those of the flax and hemp. It possesses a sweet, pleasing song, breeds well in confinement, and is a favorite cage bird, especially in Europe. In the United States the REDPOLL (*Acanthis linaria*) and the purple finch (*Carpodacus purpureus*) are sometimes called linnet.

LINOLEUM CUTS. Linoleum as a medium for block printing has become popular in the present century. Linoleum cuts are used for book and magazine illustration, posters, greeting cards, etc. A good quality of commercial linoleum of ⅛ to ½ inch in thickness, usually mounted on thin wood, canvas or linen, is commonly used. Various textures of the linoleum, smooth, stippled, grained, give different



COURTESY F. WEBER CO.

TYPES OF KNIVES AND HOLDER USED IN MAKING LINOLEUM CUTS

effects. The design or guide lines are sketched on the block with a brush and India ink or with a cutting-tool. The linoleum is cut out with wood carver's tools, chiefly the Japanese knife. The surface to be printed is left in relief; those parts are cut out which are to be white. When a print in several colors is desired, a block for each color must be cut leaving in relief only those surfaces which are to print the particular color. The blocks are then printed successively. Many inks are used for printing. Chinese ink dissolved in water and used in conjunction with rice flour paste gives the most satisfying results. This ink may be variously prepared to produce a dull or glossy print. Inks specially prepared and put up in tubes are also used. Japanese paper takes the best impressions. Linoleum cuts are durable, and from 50 to 1,000 prints can be pulled from one block. The blocks are electrotyped in commercial production.

LINOTYPE, a machine for composing lines of matrices, from which type-faced, type-high printing slugs are cast. The matrices are stored on the machine in the parallel channels of a magazine inclined about 35° from the perpendicular. The operator depresses keys on a keyboard, somewhat similar to a typewriter, which actuate triggers at the verges of the channels, releasing matrices one by one as wanted. The matrices fall upon a conveyor which brings them to the assembler, where the line is composed. Wedge shaped spacebands are dropped between the words. When the line is full, the operator depresses the transfer lever. From this point operation is fully automatic. The line is seized by a pair of vice jaws and held in casting position, the spacebands having been driven up to the position that will exactly fill the line. The mould for casting the body of the line advances into tight contact with the matrix line. The pump plunger, in a pot of melted metal, descends, forcing the liquid into the mould. The metal hardens almost instantly. The slug is then carried past trimming knives that shave it at the foot and at the bottom, and is ejected upon a galley. The matrices are then taken by a series of elevators to the top of the magazine, and distributed to their proper channels. This distribution is accomplished by an ingenious combination of teeth on the matrix and grooves on the bar upon which they travel, driven by a screw mechanism. Each matrix has its own combination of teeth. The corresponding combination of grooves on the bar terminates above the appropriate channel, letting the matrix fall into its channel. The automatic actions of the machine are driven by an elaborate system of cams, all on a single shaft, which assures perfect synchronization. E. W. P.

LINSEED OIL, the oil most generally used in the manufacture of paints, is pressed from the seed of the flax plant. Its exceptional drying (*see* DRIERS) properties accounts for its wide use. The best linseed comes from the Baltic regions, although British India and the Argentine supply large quantities of the seed. The seed is crushed and then cooked to coagulate the albuminous matter and to increase the VISCOSITY of the oil. Oil from the crushed and cooked seed is used unrefined as "raw" linseed oil for oil boiling and varnish making; it is refined for paint making.

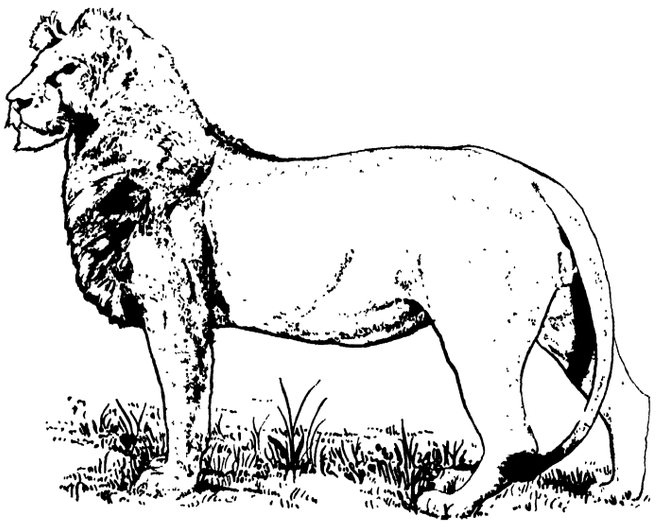
LINTON, a city in Greene Co., southwestern Indiana, 33 mi. southeast of Terre Haute. It is served by three railroads. Coal is found in this region. The

city is a distributing market for farm products and fruit. Linton was settled about 1850 and incorporated in 1902. Pop. 1920, 5,856; 1930, 5,085.

LINUS, ST. (1st century), bishop of Rome and martyr, was born and died during the 1st century. St. Linus was bishop of Rome after St. Peter (67-79), and Irenaeus asserts that he is the Linus alluded to by St. Paul in II Timothy 4:21. The Canon of the Roman Mass numbers St. Linus as one of the martyrs. His day is celebrated on Sept. 23.

LINZ, capital of Upper Austria, situated on the south bank of the Danube. It plays an important part in the river shipping and manufactures machines and locomotives, metal goods, paints and varnishes, leather, woolen goods, tobacco products and beer. It has many educational institutions, including a theological seminary. The Baroque cathedral built in the 17th century is now a Jesuit church, and a new cathedral was erected in Gothic style in 1862. The museum shows the cultural development of Austria from the Roman times, from which Linz dates, to the days of the Hapsburgs. Linz became the capital of the country in 1490 under Frederick III, who died in the Imperial Castle overlooking the city. Pop. 1923, 102,081.

LION, zoologically a big cat (*Felis leo*). The lion owes his title "king of beasts" less to actual superiority than to his majestic appearance, to which an ample mane adds dignity. The mane, possessed by males only, is the characteristic mark of the species,



LION

which is distinguished also by the plain buff coat and the peculiar tufts of hair at the end of the tail and about the limbs. These features are not developed, however, until the animal is mature, and in many cases the mane is short or shabby; black manes indicate merely a variety.

The lion originally ranged from western Asia to South Africa and Europe, where the prehistoric "cave-lion" was virtually the same animal. A few linger in northwestern India, but the more open parts of eastern Africa limit at present the home of this cat, which is not fitted for life in the Congo forests. A well-grown specimen may measure 10 ft. from nose to tail-tip, and will weigh about 400 lbs. This weight, helpful in pulling down large prey, hinders tree-climbing, although a lion can leap high, and when pressed will run with high speed for long distances. Its strength is prodigious, as shown by carrying or hauling heavy carcasses to its lair. Lions may be polygamous, but as a rule have but one mate; their union probably lasts in most cases two years, or until two or three offspring are able to support themselves. When the young are small, the parents secrete and feed them; later they accompany the lioness in her hunting. In captivity lions live 30 or 40 years and breed readily; most of those on exhibition were captive born.

Lions are naturally nocturnal, resting during the day in secluded coverts, yet often are seen abroad at all hours. At dusk they begin the search for their prey, which consists mainly of the antelopes, zebras and other animals that roam in herds in the African plains or thinly wooded tracts. It is usually in the early part of the night that their terrifying roaring is heard, especially in the mating season. Their method of hunting is to creep cautiously on the victim and then pounce upon it or to lie in ambush at watering places and strike down animals seeking to drink. In times of necessity the lion will not refuse carrion. The elephant, rhinoceros and hippo are safe from its attacks, and it rarely attempts to conquer a buffalo, but it wreaks havoc among the Negroes' cattle. Man-eating lions are not numerous in Africa, but when one appears the natives pursue and kill it with amazing bravery, although now white men with rifles are usually at hand to help them. As to the attitude of the lion toward human hunters, experience and opinions differ greatly. What happens when one is encountered depends on circumstances, such as hunger, temperament, and defense of family. The hunter never knows whether a lion will run as if panic-stricken or attack boldly with desperate ferocity.

E. I.

LIONS CLUBS, INTERNATIONAL ASSOCIATION OF, a federation of over 2,600 business and community service clubs, founded in 1917 at Chicago, Ill., to promote good government and citizenship, to unite members in "bonds of friendship, good fellowship and mutual understanding," and to provide a forum for free discussion of all matters of public interest. It is not a secret society. The organization interests itself in public charity and aids in the establishment of hospitals and of homes for orphans. National headquarters are at Chicago. In 1932 total membership was 81,000.

LI PO or **LI TAI PO** (701-762), celebrated Chinese poet, was born at Pa-Hsi, Szechwan, in 701, during the brilliant T'ang dynasty. He was of royal blood, being indeed a descendant of the Emperor Hsing-Cheng. At an early age Li Po evinced a predilection for poetry and saturated himself with the available work of his predecessors. When he was 20, he withdrew to the Min Mountains and lived a

kind of communal monastic life with a few chosen companions. Occupying himself with the writing of poetry, he managed to infuse into the old artificial forms of meter and rhythm a naturalness and simplicity so effective that he attracted the attention of the emperor as well as of many subordinate princes. He attached himself to various princely courts, composing his gay and witty lyrics amidst scenes of convivial delight. Women and wine formed the themes of his songs in all their endless variations, and the high lyrical quality of the verses as well as their perfection of esthetic appeal have endeared them to the hearts of Chinese scholars. So divinely musical are his poems reputed to be that Li Po is often affectionately called by the Chinese the Banished Angel. He died in 762 while in the service of the Prince Lin Yung.

BIBLIOGRAPHY.—*Works of Li Po,* trans. by Shigeyoshi Abata, 1922.

LIPPE, a free state in north Germany lying along the Teutoberger Wald and bounded west and south by Westphalia, east and northeast by Hanover and Hesse-Nassau; area, 469 sq. mi. Lippe lies in a hilly region and has a mild climate. Brown coal is present, also mineral springs. The state is rich in forests, principally of beech trees. Of the population, 94.6% were Protestants in 1925. Of the working people, 34.7% were engaged in agriculture and forestry and 43.8% in industry and trades. Becoming a free state in Nov. 1918, Lippe, in Dec. 1920, adopted a constitution calling for a landtag, or legislative chamber, of 21 members. Pop. 1925, 163,648.

LIPPI, FILIPPINO (1457-1504), Italian painter, was born at Prato, near Florence, in 1457. The natural son of FILIPPO LIPPI and Lucrezia Buti, he was a pupil of Botticelli, whose style he imitated. Filippino finished the frescoes begun by Masaccio in The Brancacci chapel of The Carmine, Florence, and executed the frescoes in the Strozzi chapel of Santa Maria Novella, Florence. His work is less fine in color than his father's and tends towards exaggeration and ornateness, but he had versatility, a fine ability to handle draperies and landscape backgrounds and was the first Florentine to introduce antique details of costume into his painting. Filippino died in Florence in 1504.

LIPPI, FRA FILIPPO (1406-69), Italian fresco and panel painter, was born in Florence in 1406. At the age of 14 he was placed with the Carmelite friars of the Church of the Carmine. In the Brancacci chapel of this church he studied the frescoes of Mascaccio and executed some works imitative of that master, though these have been destroyed. In 1456 while executing his most important work, the frescoes in the choir of the Prato cathedral, Fra Filippo fell in love with Lucretia Buti, his model, and abducted her from her convent; the fruit of their union was the painter FILIPPINO LIPPI. Lippi's strength lay in the sweet sentiment of his pictures and their subtlety of color; he was the first Florentine to break one tone into another. In his poem, *Fra Lippo Lippi,* Robert Browning tells the story of the boy who did not want to be a monk. Lippi died at Spoleto, probably on Oct. 8, 1469.

LIPPMAN, GABRIEL (1845-1921), French physicist, was born at Hollerich, Luxemburg, Aug. 16, 1845. After studying in France and Germany, in 1883 he became professor of experimental physics at the Sorbonne. He made researches in the fields of capillarity, thermodynamics and light, and improved methods of photography and stereoscopic reproduction. Lippman received the Nobel Prize in physics in 1908. He died at sea, returning to Europe from Canada, July 13, 1921.

LIPPMANN, WALTER (1889-), American author and journalist, was born in New York City, Sept. 23, 1889. He was educated at Harvard and entered journalism, being associate editor of the *New Republic* before joining the staff of the New York *World.* In 1917 he was assistant to the Secretary of War, and in 1918-19 served as secretary of the committee headed by Col. E. M. House to prepare data for the Versailles Peace Conference. In 1931 he joined the editorial staff of the New York *Herald Tribune.* Lippmann's publications include *A Preface to Politics, The Political Scene, Liberty and the News, Public Opinion* and *A Preface to Morals.* In 1932, he published *United States in World Affairs,* written in collaboration with W. O. Scroggs.

LIPSTICKS. *See* FACE PREPARATIONS.

LIPTON, SIR THOMAS JOHNSTONE (1850-1931), British tea-merchant, was born at Glasgow, Scotland, May 10, 1850. In 1865 he immigrated to the United States, where he worked for a while in the South Carolina cotton-fields and as a grocer's clerk in New Orleans, La. His first business venture was a small provision shop in Glasgow, which grew until he had stores throughout the United Kingdom. He was made a baronet in 1902. Lipton was internationally known for his unsuccessful attempts to win the America's cup, in 1899, 1901, 1903, 1920, and 1930, in which year he was presented with the gold Sportsmanship Cup, paid for by popular subscription in the United States. He died at London, England, Oct. 2, 1931.

LIQUEFACTION OF GASES. The most important single step in the development of methods making it possible to liquefy all gases was the discovery, by Thomas Andrews in 1860, that there is, for every substance, a certain temperature above which it cannot exist in the liquid state. This is the *critical temperature* for that substance. At any temperature below the critical and above the temperature of solidification the substance may be all liquid, all vapor, or part liquid and part vapor, according to the pressure acting on it. It follows that to liquefy any gas it must be cooled below the critical temperature and a suitable external pressure applied. This pressure will diminish as the temperature falls until finally the BOILING POINT of the substance is reached. The liquefied pure gas will then remain at this temperature, cooling itself by evaporation, until the inflow of heat is sufficient to evaporate the whole just as boiling



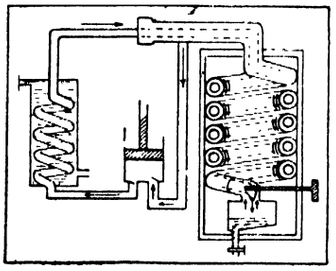
COURTESY CONSULATE GENERAL OF PORTUGAL

THE ARCHITECTURAL BEAUTY OF LISBON

1. The Avenida da Liberdade, the main thoroughfare of Lisbon. 2. The Rocío and monument to Pedro IV.
3. Horseshoe-shaped portals are a unique feature of the Rocío Station. 4. The Praça do Commercio and equestrian statue of Joseph I.

water remains at a constant temperature until it is all converted into steam (*see* LATENT HEAT). A knowledge of the values of the constants in van der Waals' equation of state, obtained by experiments on the compressibility of the gas, makes possible the predetermination of the critical temperature, and application of the law of corresponding states gives the boiling point.

All liquefaction plants are essentially mechanical REFRIGERATION plants in which the temperature is lowered by taking advantage of the fact that the expansion of a body of gas is accompanied by a loss of heat. The figure shows, in simplified form, the essential parts of such a plant. Commercial installations employ the same sequence of compression, pre-cooling, expansion and regenerative cooling. Both compression and expansion usually take place in two stages. In the Claude process, the first expansion of a part of the air is carried on in a cylinder like that of a STEAM ENGINE, and the heat generated during this stage is, at least in theory, available for doing external work. A. A. K.



LIQUEFACTION APPARATUS

LIQUEURS, a name for strong spirits sweetened with sugar and flavored with various aromatic substances and sometimes colored. The best quality is prepared by steeping the flavoring substances, which include seeds, leaves and other parts of certain plants, in spirit, distilling the infusion and adding sugar, and, in some cases, coloring material. The alcoholic strength of liqueurs ranges from 80% in some kinds of absinthe to 27% in anisette.

Benedictine is an aromatic liqueur made originally from a secret formula, in the Abbey of Fecamp on the Normandy coast.

Chartreuse is a green or yellow liqueur made at one time at La Grande Chartreuse, France, by the Carthusian monks. Though the recipe is a secret, it was supposed to be made by the distillation of brandy and a certain herb native to that region.

Creme de menthe is a liqueur prepared from spirit with the addition of essence of peppermint. The best quality is made from cognac brandy.

Curacao is a liqueur originally made in the island of Curacao in the Dutch West Indies by distillation of spirit and the peel of a special variety of orange. To-day ordinary orange peel is used, and the beverage sweetened and flavored with Jamaica rum. One variety of Curacao, made with a fine quality of brandy, is known as "Grand Marnier."

Kummel is a liqueur flavored with cumin and caraway seed. It has a sweet taste. H. T. B.

LIQUID AIR, a clear, colorless, or pale blue, liquid with a density nearly equal to that of water and boiling at about —190° C. First produced outside the research laboratory by CARL VON LINDE in 1895, it is now an important industrial product. As air is a mixture of gases having different BOILING POINTS, the composition of liquid air is not constant. It is possible to separate the various constituents either by fractional DISTILLATION or by the proper regulation of temperature during liquefaction (*see* LIQUEFACTION OF GASES). Liquid air is used widely as a means of producing low temperatures, as a source of the rare gases of the atmosphere, particularly ARGON and NEON, and as a source of liquid OXYGEN.

Because of its low boiling point and the enormous pressure which it would develop in a closed space, liquid air must be kept and transported in open vessels and is subject to continuous loss by evaporation. In practice, this difficulty is not particularly serious. Small quantities are kept in VACUUM FLASKS and larger amounts in insulated tanks.

The manufacture of liquid oxygen for use as an EXPLOSIVE and for other industrial purposes is carried out in plants similar to those used for the liquefaction of gases, but modified in such a way that most of the NITROGEN, which boils at —195.8° C., passes through without liquefaction, while the oxygen, boiling at —183.0° C., is liquefied.

Cloth sacks or cartridges of finely divided carbon soaked in liquid oxygen may be used to replace the ordinary explosives in mining. These cartridges are fired by a DETONATOR and, since the combustion is almost instantaneous and results in the production of large volumes of hot gases, the liquid oxygen is as efficient as either black powder or dynamite. It is economical and safe to handle, and an unexploded charge is not a source of danger. On the other hand, the cartridges deterioriate rapidly due to evaporation of the oxygen, and an insufficient amount of oxygen may result in the formation of large quantities of highly poisonous CARBON MONOXIDE. A. A. K.

LIQUIDAMBAR, a genus of trees of the WITCH-HAZEL family comprising about four species native to eastern North America, Central America and Asia. They are handsome trees with balsamic juice, alternate palmately lobed leaves, small flowers borne in globular heads and a burlike fruit. The SWEET GUM (*L. Styraciflua*), a valuable timber tree found from Connecticut to Florida and Mexico, is often planted for ornament. It yields the gum resin known as liquidambar or sweet gum copalm, produced chiefly in Mexico, used in the manufacture of chewing gum, as a perfume for gloves, and sometimes in medicine instead of STORAX. An Old World species (*L. orientalis*), native to western Asia, produces the balsam called liquid storax used in medicine, incense and perfumery.

LIQUID ASSETS, a term used synonymously with CURRENT ASSETS. It is sometimes restricted to CASH, salable securities—i.e., temporary INVESTMENTS—and receivables.

LIQUIDATION, the winding up of a debtor's affairs or settlement with creditors; also the determination of the debts or balance due. The word, which is of French origin, has no precise legal meaning other than as generally used in commerce and finance. In

some states provision is made by statute for the liquidation of banks, partnerships and other associations. The object of such laws is to afford a speedy and inexpensive method for winding up failed banks and corporations. The Liquidation Section of the New York Banking Law says "The events which led to its enactment are familiar history of which we may take judicial notice. The financial depression of 1907, and the resulting embarrassment of many banks culminated in a series of receiverships in which the demands for commissions and counsel fees were so extravagant as to arouse an instant popular demand for reform. To that end the superintendent of banks was by statute invested with the powers which had previously been exercised by receivers appointed by the court." C. F. We.

LIQUID FUELS, fuels burned in the combustion chambers or cylinders of Furnaces, Boilers, or Internal Combustion Engines. They are liquid at normal temperatures, or after slight heating, in contrast to solid and gaseous fuels. In the broadest sense the term includes not only petroleum and shale fuel oils and coal tars, but also kerosene, gasoline, benzol, alcohol and similar substances. *See* separate articles on each of these subjects. More generally the term is restricted to those substances that are burned in a mechanically atomized condition rather than in the form of a vapor. In this sense the term is applied only to petroleum fuel oil, shale fuel oil, coal tars, and similar high-flash-point and non-volatile substances. Commercially, petroleum fuel oil is by far the most important. Cleanliness, high-unit heating value and ease of handling make it a most desirable fuel. When used in heavy oil or Diesel engines for the production of power the thermal efficiency is much higher than that obtainable by the combustion of coal or other solid fuels. *See also* Fuels, Oil Engines. E. R. L.

LIQUID PHASE PROCESS. *See* Cracking Processes; Phase Rule.

LIRA, an Italian silver coin of par value of 5.2631 cents. It is divided into 100 centesimi.

LISBON (Portuguese *Lisboa*), a city and the capital of Portugal, beautifully situated on seven terraced hills on the north of the large bay formed by the mouth of the Tagus River. The newer sections, mostly built after the devastating earthquake of 1755, have fine streets and squares beautifully decorated with trees, shrubbery and flowers in contrast to the narrow, dingy streets of the small old town. The hills are negotiated by funiculars and elevators. Among the notable churches are the patriarchal cathedral, 1150; São Vicente de Fora, also of the 12th century, and Nossa Senhora da Conceicao. The buildings of note include also the Moorish castle, the arsenal, the parliament and other public buildings and the former royal palace. The wide Avenida da Liberdade with broad park areas blazes with the scarlet blossoms of Judas trees which have the verdure of palms for a background.

Lisbon is the first industrial city in Portugal and furnishes principally cork, paper, woven goods, leather, ceramics, gold and silver filigree and jewelry. The chief imports are coffee, cotton, coal, rice, sugar and other food products. The city has a university and other schools, but about three-fourths of the population are illiterate. *See* Portugal, *History.* Pop. 1931, 594,390.

LISIEUX, an old town in Normandy, about 30 mi. west of Caen. Its cathedral of St. Pierre, 12th and 13th centuries, is the oldest Gothic church in the province, and is notable for its beauty of proportion. The rather severe façade is flanked by two towers, one of the 13th century, the other a curious example of Romanesque work done in the 16th century. The interior, in pure early Gothic style, contains excellent carvings, and several good windows of the 12th, 13th and 15th centuries. Lisieux has kept something of its medieval aspect, although it is a center both of textile industries and agricultural products. In recent years it has attracted many pilgrims to the shrine of St. Thérèse of the Infant Jesus, who was a nun there. Pop. 1931, 15,362.

LISSA. *See* Vis.

LISTED SECURITIES, securities which have been accepted as meeting the requirements of a Stock Exchange and are therefore eligible to be traded in and quoted on the floor of such exchange. Each stock exchange has rules which must be complied with before a security is admitted to trading. Statements detailing every phase of the financial and operating status of the applicant must be filed. On the New York Stock Exchange applications are considered by a special committee whose decisions are subject to review by the board of governors. A corporation seeking to list must have been in operation over a sufficiently long period to demonstrate its character, earning capacity and the integrity and business ability of its officers. After their stocks have been listed corporations must publish balance sheets, statements of earnings, announcements of directors' meetings, dividend meetings and the open and close of transfer books; they are advised to make public such information as will allow all interested to form an intelligent opinion as to the value of the company's securities. While listing does not guarantee the buyers that such securities possess worth, acceptance for listing does guarantee the physical genuineness of the security traded in. It also compels corporations to prevent the issuing of false certificates and over-issue of stock. The certificates of listed securities must be engraved on a certain kind of safety paper and the company listing must maintain a separate transfer agent who is responsible for transfers and a registrar who is responsible for over-issue. Listing increases the marketability of a security and makes borrowing easier.

LISTER, JOSEPH LISTER, First Baron (1827-1912), English surgeon, founder of antiseptic surgery, was born at Upton, Essex, April 5, 1827. He graduated in medicine from the University of London in 1852. Following the advice of his teachers, he went to Edinburgh to continue surgery under Syme, who made

him house surgeon in 1854. In 1860, Lister became professor of surgery in the University of Glasgow. His classical paper on excision of the wrist for caries attained considerable fame for him in the surgical world. Early in his hospital life, Lister had been impressed with the high death rates from such surgical complications as septicemia, pyemia, erysipelas, tetanus, and hospital gangrene. His attention was accidentally drawn to Pasteur's work. He determined to prevent the development of microörganisms in wounds. On August 12, 1865, he used carbolic acid in a case of compound fracture with complete success. Following Lister, modern surgery has become almost entirely aseptic, discarding strong antiseptics in the dressing of wounds. The Listerian ideal of avoiding sepsis remains the same. In the obstetrician's hands, Listerism is now the main safeguard of the woman in childbirth. To Listerism are due all modern developments of the surgery of the hollow cavities of the body, including the cranium, chest, abdomen, the joints and the male and female pelvic viscera. Lister died in 1912. M. F.

LISTER, or middle "Buster," a special type of PLOW for ridging and furrowing fields, which splits the soil and throws half the furrow slice to each side. It is often equipped with a drill for planting corn or cotton between the ridges. *See also* RIDGER.

LISZT, FRANZ (Ferencz) (1811-86), Hungarian pianist and composer, was born at Raiding, Oct. 22, 1811. He appeared in public at the age of nine, and began studies with CZERNY soon afterward. His hope of entering the Paris Conservatory, the entrance examinations of which he passed successfully, was quashed by CHERUBINI's refusal to admit students of his age. He therefore studied composition under Salieri, Paer, and Reicha, and by his own efforts brought his mastery of the keyboard to a point of perfection that transcended the virtuosity of his most serious rival, Sigismund Thalberg. At the age of 29 he began a series of concert tours throughout Europe. For a decade his brilliance of execution amazed his auditors. He was appointed court capellmeister at Weimar, and while occupying that post exercised himself on behalf of RICHARD WAGNER whose genius he was the first to recognize. Despite his wide activities as conductor, critic, and teacher he found time to compose. In 1859 he left Weimar for Rome, where he lived for ten years and where Pope Pius IX in 1866 conferred on him the title abbé, although he never took final orders. In 1870 he returned to Weimar, five years later was made president of the Hungarian Academy of Music in Pesth, and in the last year of his life made a triumphal tour of Europe. During his Weimar period he formed a liaison with the countess Carolyne Sayn-Wittgenstein, to whom he left his entire property, while from 1835 to 1839 he lived with the countess D'Agoult. She bore him three children, one of whom, Cosima, married HANS VON BÜLOW, later becoming the wife of Wagner.

The greatest pianist of the 19th century, Liszt wrought an enduring revolution in pianism, with respect to pure technic and tonal color. As a propagandist his defence of Wagner specifically, and of the romantic movement generally, he had an important influence on the future course of music. As a composer, both for the pianoforte and the orchestra, he is credited with contributions almost as valuable; indeed, the symphonic poem is virtually his invention. His works include a pianoforte sonata in B minor and two concertos, fifteen Hungarian rhapsodies, innumerable transcriptions, and technical studies of the first order; many symphonic poems (*Les Preludes, Tasso, Dante, Faust,* and *Mazeppa* are the most famous); three oratorios, *Elisabeth, Christus,* and *Stanislaus,* and a large number of shorter choral compositions. He died at Bayreuth, July 31, 1886.

LI TAI PO. *See* LI PO.

LITANY (from the Greek for begging, beseeching), in the Catholic Church a prayer said or sung in procession with responses by the congregation. There is a long and a short litany. The beginning is always *Kyrie eleison!* ("Lord have mercy upon us!") and the litany ends with the *Agnus Dei* ("O Lamb of God, that takest away the sins of the world, have mercy upon us!"). There are but four litanies approved by the Roman Catholic Church: the Litany of the Saints, the prototype of all the others; the Lauretanian Litany of the 13th or 14th century, a prayer and song of praise to Mary, named after the Chapel of the Blessed Virgin in Loreto (Lauretum), where it was first used; the Litany of the Holy Name of Jesus, approved in 1862; the Litany of the Sacred Heart of Jesus, approved in 1898. The litany is also used in divine service, especially on penitential days, and was revised by Martin Luther for use in the Protestant Church. The litany of the Anglican Church, also revised, is appointed to be used after morning service on Sundays, Wednesdays and Fridays, and in Anglo-Catholic parishes is also sung in procession.

LITCHFIELD, a city in Montgomery Co., south of central Illinois, situated 52 mi. northeast of St. Louis, Mo. Bus and truck lines and four railroads afford transportation. There is an emergency landing field. Grain is the chief crop of this region. The manufactures include shoes, radiators and hoisting engines. Coal mines are found near by. Litchfield was founded in 1853 and chartered in 1859. Pop. 1920, 6,215; 1930, 6,612.

LITCHI (*Litchi chinensis*), a tree of the soapberry family, native to China where it has been cultivated since ancient times for its luscious fruit. It is now extensively planted in tropical regions, especially in southern China and in India. The tree grows 30 to 40 ft. high bearing pinnate leaves and inconspicuous greenish flowers. The fruit, an oblong drupe, 1 to 1½ in. in diameter, with a thin, brittle, very rough outer covering, has a sweet, juicy, whitish pulp. Preserved in syrup or dried like raisins (litchi nuts), the fruit is an article of commerce.

LITER, a measure of volume, the unit of capacity of the METRIC SYSTEM, containing 1,000 cu. cm. and

equivalent to 1.056 U.S. liquid quarts or 0.8799 imperial quarts. The original standard kilogram was the weight of one liter of distilled water at its maximum density, but that relation is slightly in error, although accurate enough for all practical purposes. The liter is not a vessel and its volume is ascertained by weighing and not by measurement.

LITERARY COMPOSITION, FORMS OF. The two outstanding headings in the forms of composition are PROSE and POETRY. Everything written falls into one or the other of these two divisions, and DRAMA may fall into either. Prose is sub-divided into two main divisions, FICTION and non-fiction. The chief forms of fiction are, in alphabetical order, adventure story, CONTE (the French form of the short story), detective story, drama, FABLE, FAIRY TALE, FOLK STORY, MYSTERY STORY, NOVEL, PICARESQUE ROMANCE, ROMANCE and SHORT STORY. The chief forms of non-fiction are article, BIOGRAPHY, ESSAY, history, SATIRE, TRAVELS and TREATISE.

In poetry, the three main divisions are EPIC, LYRIC and drama All ballads and heroic verse and other forms of narrative are classed in the epical division. The chief forms of the lyric are ELEGY, HYMN, lullaby, ODE, PASTORAL, RONDEAU, SONG and SONNET.

The drama, as stated above, may be written in either prose or poetry. Until the 19th century tragedy was almost always written in verse, but the poetical form is no longer considered obligatory for tragic plays. The two main divisions of the drama are TRAGEDY and COMEDY. Tragedy, in its turn, may include tragedy proper, or TRAGI-COMEDY. Comedy has more numerous subdivisions. These include burlesque, FARCE, MELODRAMA, as well as the up-to-date play of modern manners and morals called in the United States the comedy of manners and in England, in which country it is a predominant form, the drawing-room comedy. In addition, mention must be made of the CHRONICLE and MYSTERY PLAYS, and of the modern PROBLEM PLAY, none of which can be classed as either strictly comedy or tragedy. The chronicle plays were based on history and the mystery plays on Biblical or religious subjects, while the modern problem play, usually serious in theme, may, and frequently does, have a happy ending, besides possessing too many humorous characters and amusing lines to permit of its being classed as pure tragedy.

LITERARY CRITICISM, the term in use for the expression of judgment on any literary work and for any system of rules upon which such judgment is based. Literary criticism begins with ARISTOTLE; his influence has been so profound that many of his most famous dicta are still quoted by modern authorities. He remains the supreme critic of antiquity, the Romans producing little criticism, although Cicero, Horace, Seneca, Tacitus and Quintilian were responsible for some dicta often pronounced more as casual comments than as deliberate rules of criticism.

Aristotle's influence was supreme among the Italians of the Renaissance who even went further than he in insisting on the idea of unity. It has been constantly urged that Aristotle's restriction, which applied to Greek literature, pressed unduly on later European critics, and that European literature was hampered thereby. It is certain that the Greek idea took deeper root in France than elsewhere, with, as some critics believe, a certain amount of detriment to the French drama. France of the 17th and 18th centuries was the battlefield of ideas relating to criticism, and with MALHERBE came the establishment of a rigid system of rules based on those of the Italians of the Renaissance and consequently on the doctrines of Aristotle. The great Elizabethan poets and dramatists had completely disregarded the three unities, but French influence was so strong in the 17th and 18th centuries that even such men as JOHN DRYDEN and SAMUEL JOHNSON were dominated by the classical tradition.

With the end of the 18th century came a profound change. The rise of the Romantic School (*see* ROMANTICISM) loosened the hold of the classical tradition and a new chapter of criticism was opened. In France the great names were those of Sainte-Beuve, Taine, Brunetière and Lemaître, and, in England, Lamb, Hazlitt, Arnold, Pater, Gosse and Saintsbury; the Dane, Georg Brandes, surveyed the whole of European literature. In America Emerson, Barrett Wendell, Child, Ticknor, Lowell and Stedman all made valuable contributions to literary criticism, the present century including the names of Irving Babbitt, Stuart Sherman, Carl Van Doren, Paul Elmer More, and H. L. Mencken.

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LITERARY PROPERTY, the legal interest an author has in his works. At COMMON LAW a writer of any sort of composition, from serious articles to comic opera, had a right to them so long as they were not published. By publication is not meant quasi-public reading, as, for example, giving an exhibition of a play. Letters, while the manuscript is owned by the receiver, cannot be published without the consent of the writer, except to contradict accusations made by their author. COPYRIGHT laws do not take away any common law rights of authors. These rights descend to representatives, and cannot be taken by creditors for publication. An INJUNCTION in Equity is the usual method of procedure in protecting rights, whether the author decides to prevent his own works being used or his name being signed to matter he did not write. Both BYRON and BRET HARTE chose the injunction to prevent their names being illegally used.

LITHIUM, a white metallic element of the alkali family whose symbol is Li, atomic weight 6.94, specific gravity 0.534, melting point 366.8° F., specific heat 0.941. It crystallizes on a body centered cubic lattice. It is the lightest of all known metals and floats on water and kerosene. It is silvery white when freshly cut, but tarnishes rapidly. It is softer than lead and is easily cut with a knife, is chemically

active; decomposes water; burns in oxygen and hydrogen; combines vigorously with most non-metallic elements; reduces most metallic compounds. It is prepared by the electrolysis of its fused chloride. It has no practical use at present, but many promising possibilities due to its lightness. A. J. Ki.

LITHOGRAPHIC STONE, a form of LIMESTONE particularly fine-grained and homogeneous, and adapted to printing purposes. It is pure but slightly schistose. Due to its slight porosity it will retain oily or greasy material, a property utilized in lithographic printing. The design is drawn on the polished surface of the stone with special crayon or ink, or transferred to it from paper or a photograph. The exposed surface is etched with acid, leaving the design untouched, and capable of retaining printing ink. Lithographic limestone from Bavaria is particularly well known; it is also found in France and elsewhere.

LITHOGRAPHY, a term applied to method of printing from stone. The process is based upon the antipathy between grease and water. The LITHOGRAPHIC STONE is a compact, fine-grained lime stone (calcium carbonate), and is found extensively in Bavaria. It has a very definite affinity for grease, and, being of a porous nature, readily retains the moisture of grease. The crayon with which the drawing is made directly on the clean, polished or grained surface of the stone is a composition made in varying densities of wax, shellac, tallow, soap and lamp black.

Lithographic stone is wholly soluble in certain acids, nitric acid being the most commonly used, while the crayon is practically impervious to nitric acid when it is diluted with gum arabic and water. As a result, if the stone be partly covered by the crayon and the entire surface or printing area be brushed over with this solution, the acid etches the bare surfaces, while the crayon, in resisting the action, protects those areas which it covers. The chemical action of the etching solution makes those surfaces which it contacts more receptive of water and, consequently, repellant to grease. The various methods of printing can be classified under three different heads: relief, intaglio and planographic. Lithographic printing correctly termed should be classified as chemical planographic.

Printing from stone is accomplished while the printing surface of the stone is under a film of water, i.e., dampened. The stone, being porous, readily accepts and retains the moisture, while grease as readily resists water. A lithographic printing press contacts its printing surface, first with water, secondly with ink and thirdly with the paper on which it prints a replica of its printing surface. This action is constant: the water resists the greasy ink; the ink repels the water; the inked surfaces of the stone accept additional deposits of ink; the paper removes the excess deposit in the form of an impression.

The discovery of chemical printing from stone was made in 1796 by ALOIS SENEFELDER, a Bohemian. While his ultimate discovery of the chemical process of printing from stone was accidental, it was the natural outcome of years of experiment. Printing from the raised surface of a stone was well known in his day. In his autobiography, he tells of having polished the surface of a slab of Kelheim stone, so named after the town in which it was quarried. Not having at the moment a piece of paper, he had taken a stick of dried printing ink, and with it had written his mother's laundry list on the face of the stone. Before washing off the ink writing, he wondered what might happen if he etched the stone before washing it off. He tried the experiment, and thereby discovered the chemistry of lithography. He lived to perfect the art and to write a text book on it.

Lithographic Printing Inks. These inks are fluid compared to lithographic crayons, but are very similar in chemical composition. By the substitution of coloring matter for lamp black, varying hues are obtained. The basic principle of both crayon and ink is substance holding in suspension various fatty matters—shellac, wax or tallow. Lithographic inks are transparent, so that, by printing one color over another, the resultant effect is practically the same as that employed by an artist in mixing separate colors to obtain a desired hue or chroma. The possibilities in the use of colored inks were early recognized, as well as the almost limitless possibilities of printing more than one color on the same sheet. Hence, the step to printing pictures in full color was a natural development. Each color, however, is a separate operation necessitating an individual printing surface To reproduce with fidelity an original painting often requires from 15 to 20 or more separate printing surfaces and the passing of the paper or other material to be printed through a printing press bearing one color of ink. Ink is applied wherever it is to appear in the ultimate product, alone or in combination. Later it must pass through succeeding presses and be printed with the other colors in succession until the reproduction is complete.

Types of Lithography. *Chromo-lithography,* the process of printing from stone a picture in colors. The art of lithography offered the first mechanical means of reproducing a number of replicas of an original painting. The term chromo-lithography aptly describes the process of printing in color from stone. A trade name rapidly took root, the prints being known as chromos. There is no difference between lithographic color printing and chromo-lithography.

Photo-lithography, the art of reproducing a drawing on stone by means of photography, as distinguished from drawing it on stone by hand. The art of photography having been partly perfected by Daguerre and Niepce in 1839 it was by 1841 further developed by Talbot, who first produced photographic negatives from which any desired number of positive prints could be obtained. These pioneers early recognized the possibility of producing printing surfaces by this method. The development of photography, particularly color separation by photography has been constant with the development of printing, so that now most printing surfaces are produced by it. Photo-lithography has, in turn, greatly reduced the number of printings necessary in fac-simile reproduction.

Litho Transfer, the transferring of a single reproduction into multiples. This was accomplished by making impressions of the original drawing in the desired number, and, while these impressions were still undried, laying them face down on a second, larger printing surface. After they were firmly attached in position by pressure, the paper was dissolved and removed, leaving the ink adhered to the second printing surface. From this point to the final preparation for printing these transfers were etched and handled in much the same manner as an original drawing. The process was called hand transferring.

Photo-Composing, a process whereby multiples of a single printing surface, or a combination of several different surfaces, are photographically assembled on a larger printing surface. Particularly in multi-color printing, the accurate register of the separate colors is necessary; that the printing surfaces for each color be identical in size as well as accurate in the relative positions of the objects being printed is most essential. This is accomplished by photo-composing with an accuracy of less than three one-thousandths of an inch in variation of position and with no variation in size. An American, Huebner, was the pioneer and inventor of this new branch in the art of printing.

Aluminography, the process of printing from an aluminum surface by the same method as is used in chemical planographic printing from stone.

Zincography, a process like aluminography with the substitution zinc for aluminum. The development of lithographic printing has resulted in the substitution of zinc or aluminum printing surfaces for the original stone surface. The use of metal permits printing from a revolving cylinder, around which the metal printing surface is attached. The cylinder provides for a larger printing surface and greater speed in production. H. S. M.

BIBLIOGRAPHY.—Alfred Seymour, *Practical Lithography;* David Cumming, *Handbook of Lithography;* Joseph Goodman, *Metalithography;* Alois Senefelder, *The Invention of Lithography;* Alois Senefelder, *Textbook of Printing from Stone.*

LITHOPONE, a white PIGMENT composed of approximately 30% zinc sulphide and 70% barium sulphate. It is manufactured by the mutual precipitation of carefully purified solutions of zinc sulphate and barium sulphide. The dried precipitate is calcined at temperatures varying from 500° to 800° C., and quenched in water. This process develops the characteristic color and hiding power of the pigment. Subsequently, the material is ground, dried and disintegrated. Lithopone, on account of its high tinting strength, hiding power and color retention under normal conditions of exposure, is one of the most extensively used white pigments. In recent years the great proportion of the production has been employed in the paint, varnish and lacquer industry, for both interior and exterior finishes. Other products employing lithopone in their manufacturing processes, listed in order of consumption, are linoleum, oil cloth, wall covering, and rubber. B. R. S.

LITHOSPHERE, the envelope of rocky material surrounding the probably metallic core, or BARYSPHERE, of the earth. It is about 2,000 miles deep, and by certain authorities is assumed to be divided into the surface "Zone of Fracture" where the rocks are not subjected to great enough pressure to prevent their fracturing under stress; 30 miles deep this is followed by the ASTHENOSPHERE in which molten rock magmas have their origin, and which extends to a depth of roughly 1,000 miles; between this and the core lies the STEREOSPHERE, 1,000 miles thick, where the rocks are rigid because of the tremendous pressures.

LITHUANIA, formerly a province of Russia, now an independent republic, bounded on the north by Latvia, on the south by Germany and on the east and southeast by Poland. Independent Lithuania comprises 20,426 sq. mi. After the World War the boundaries between Poland and Lithuania were not fixed, and Lithuania claims certain territories in the south: the province of KAUNAS or Kovno; portions of the provinces of VILNIUS or Vilna, GARDINAS or Grodno, Suvalki, and Courland; and the territory of KLAIPEDA or Memel. Lithuania was given administrative control over Memel (943 sq. mi.) in 1924 but Poland was also given shipping rights. At present Poland occupies the other disputed lands, 10,808 sq. mi.

Nearly half of the territory of Lithuania is under cultivation, the remainder being equally divided between forest, pasture and meadowland. The surface is generally low, no point of land rising higher than 1,000 ft. above the sea. The chief agricultural products are rye, wheat, barley, oats, potatoes, peas and flax. In 1929 the output in metric tons of these products was: rye, 557,460; wheat, 239,980; barley, 260,245; oats, 516,445; potatoes, 1,220,000. In the same year the country possessed over 1,000,000 cattle, as many pigs, and 1,125,000 sheep. The chief exports are corn, timber, cattle, poultry, eggs, hides, linseed, flax and butter. The imports include agricultural machinery, manufactured articles of all kinds, chemicals and fertilizers. In 1928 the total value of the exports was 256,881,300 *litas,* and of the imports 291,091,400 *litas,* a *lita* being equal to ten cents. The trade of Lithuania is chiefly with Great Britain, Germany and Czechoslovakia.

The population of Lithuania in 1931 was 2,367,000. The bulk of it belongs to the Roman Catholic religion. There are large Protestant groups and considerable numbers of Jews and Greek Catholics. Kaunas, or Kovno, with a population of 98,330, is the seat of government, but the Lithuanians claim Vilna, in Poland, as their traditional capital; serious boundary difficulties have existed between the two countries and are not yet definitely settled. Other important towns are Klaipeda (Memel), pop. 36,988; Siauliai, 22,996 and Panevezys, 20,384.

The language of the Lithuanian people is kindred to that of the Letts and belongs to the Aryan group. Education in the country is compulsory and illiteracy has been practically wiped out. In 1927 there were 2,780 primary and secondary schools with an enroll-

ment of 185,000. Higher education is offered by the University of Grand Duke Vytautas (until 1930 the University of Kovno), founded in 1922 and having a student body of approximately 5,000 and a teaching staff of 250. There is also an Academy of Agriculture at Dotnuva.

Lithuania, like Latvia, its sister republic to the north, is in a sound economic condition. The government manages to effect a balance between revenue and expenditures, which average about 275,000,000 *litas* a year. In 1929 the total internal and external debt of Lithuania was less than $9,000,000. The Bank of Lithuania, established in 1922, has the sole right to issue the national currency.

According to the constitution adopted in 1922 and amended in 1928 the legislative authority is vested in a single chamber, called the *Seimas*. The members of the chamber are elected for a term of five years, and the executive power is in the hands of the president who is elected directly by the people for a term of seven years. For administrative purposes the state is divided into 20 districts, which are in turn subdivided into communes, 15 to each district.

LITHUANIA, HISTORY OF. The Lithuanians, with the Letts, are regarded as a separate branch of the Indo-European family, distinct from, but closely related to, the Slavs. By the end of the 14th century—some 400 years after their appearance in this part of Europe—the Lithuanians, under their local princes, had extended their sway from the Baltic Sea on the north almost to the Black Sea on the south, and from Kiev and the Dnieper River on the east to Poland on the west. Meanwhile, too, they had become Christianized through the efforts of the Teutonic Knights.

In 1386, the marriage of Grand Duke Jagiello (Jogaila) to Queen Hedwig (Jadwiga) of Poland laid the basis for a union between the two countries, which was strengthened in 1501 when Alexander, of the House of Jagello, became both king of Poland and grand duke of Lithuania. This union was made permanent during the reign of Sigismund II (1548-72) by the Union of Lublin, July 1, 1569. Thereafter, the fortunes of Lithuania and Poland were intertwined, and as a result of the third partition of Poland (1795), Lithuania became a Russian province. This it remained until 1918.

Independence. As an oppressed nationality in Russia, the Lithuanians took part in the unsuccessful Polish revolts of 1831 and 1863. Each time severe penalties were inflicted on the revolutionaries, and, from 1863 to 1903, it was forbidden to print anything in the Lithuanian language. While Russia was busily engaged fighting the war with Japan in 1904-05 and putting down the revolution of 1905, a Lithuanian congress at Vilna sought in vain to secure local autonomy for the province. Even the Tsar's grant of a Duma to his subjects availed the Lithuanians but little, since the elections in and around Vilna were supervised by Russian and Polish officials who successfully kept any Lithuanians from winning seats. The defeat of Russia in the World War and the Bolshevist Revolution (1917) renewed the hopes of the Lithuanians for freedom, and on Feb. 16, 1918, they declared themselves independent. Lithuania's new status was recognized by Germany on Mar. 23, but the exultant people, in return, were made to accept Prince William of Urach as their king. With the end of the War, however, a group of patriots reestablished the national council or *Taryba* (Jan., 1919), and, on Apr. 4, Antonas Smetona was elected president of a provisional government.

The provisional government soon found itself faced with the dual task of combating foreign military foes and securing satisfactory boundary lines. A Russo-German army, known as the Bermondt-Avalof force, had to be convinced that Lithuania was not to be utilized as a base of operations from which to restore the control of the Baltic barons in Latvia. Late in 1918, moreover, a Bolshevik army invaded Lithuania, and, by the following January, it had captured Vilna. The provisional government retired to Kovno (Kaunas), but a force of patriotic young volunteers checked further Russian advances. Then the Bolsheviks, simultaneously embroiled in a larger war with Poland, gradually withdrew from Lithuania, and on July 12, 1919, signed the very liberal Treaty of Moscow with that country. Russia recognized the independence of Lithuania, agreed to pay her a large money indemnity and consented to the incorporation of Vilna and Grodno within her boundaries.

Polish Occupation. In 1921, Lithuania's northern boundary was fixed by treaty with Latvia. Two years later, despite an ardent protest by Germany, the Council of Ambassadors accorded Lithuania sovereignty over the Memel district (1,520 sq. mi.) which had been taken from Germany and placed under the control of an Allied commission by the Versailles Treaty. Through a Paris Convention of May 8, 1924, Memel (Klaipeda) became an integral part of Lithuania. The most difficult boundary question which faced Lithuania, however, concerned the Polish frontier.

Although both the Allied Supreme Council and the Bolsheviks had recognized Vilna as Lithuanian territory, a Polish general, Zeligowski, acting on his own initiative, occupied the region around Vilna with a free-lance army on Oct. 9, 1920. The Polish government claimed not to have had a hand in the occupation, but Polish public opinion supported the action and the Polish troops remained in control. On Feb. 3, 1923, after repeated attempts by the League of Nations to promote an amicable settlement of the quarrel, the Council of Ambassadors recognized Polish control of Vilna. Nevertheless, in the amended Lithuanian constitution of 1928, Vilna was still designated as the capital city, and Kaunas is still regarded merely as the temporary seat of the Lithuanian government. There appears to be slight chance of the establishment of friendly relations between the two rival powers so long as Poland retains Vilna. (*See* CURZON LINE.)

Government. A Lithuanian constituent assembly was convened on May 15, 1920, and on Aug. 1, 1922, a constitution was adopted. As amended in May, 1928, this document provides for universal suffrage and responsible government. The Diet or *Seimas* is elected for five years. The president is elected by popular vote for seven years. On Sept. 21, 1921, Lithuania became a member of the League of Nations. Commercial treaties were signed with the chief European states, and, in 1926, a non-aggression pact was negotiated with Russia. On Jan. 16, 1927, a draft convention for a customs union with Latvia and Esthonia was signed.

The rampant nationalism which afflicted Lithuania, as well as so many of the other new states, after the World War expressed itself officially by a military *coup d'etat* in Dec., 1926, in which the Socialist President Grinius and Premier Slezevicius were forced out of office and succeeded by President Antonas Smetona and Premier Augustinas Woldemaras. Smetona's term would only have been for three years, but the amended constitution of 1928 extended it to seven years. From 1926 until his ousting in Sept., 1929, Woldemaras was dictator of Lithuania. He used his power in the interests of conservatism and nationalism, arresting thousands of opponents, especially "radicals," suppressing labor agitation, forbidding public gatherings, dissolving Socialist societies, getting the age limit for voters raised from 21 to 24, and taking an uncompromising stand in the Vilna dispute with Poland. An abortive conspiracy against Woldemaras and an attempt on his life in May, 1929, led to his resignation the following September. He was succeeded by the Nationalist, Jonas Tubelis, who became premier on Sept. 25 and who was upheld in the next parliamentary elections. W. C. L.

BIBLIOGRAPHY.—O. Rutter, *The New Baltic States and Their Future: An Account of Lithuania, Latvia and Estonia,* 1925; E. J. Harrison, editor, *Lithuania,* 1928.

LITHUANIAN, the most important member of the BALTIC linguistic family, spoken by nearly 3,000,000 people, two-thirds of whom live in Lithuania itself. Much of the Lithuanian linguistic area, however, lies in Poland, East Prussia and Latvia; while some 400,000 Lithuanians live in the United States, chiefly in Chicago, Pennsylvania and Massachusetts. Lithuanian consists of a large number of dialects which fall into the two main categories of High and Low, the literary language being based on a High dialect. Because of the very conservative character of its vowel-system and of its declensions (the verb, on the contrary, has undergone sweeping changes), as well as because of its retention of free ACCENT, Lithuanian ranks with Sanskrit, Greek and Slavic as one of the most important sources for all study of Indo-European linguistics.

The earliest literary document of the language is a catechism published in 1547; but the outstanding creative author of the older period was the poet, Christian Donalitius (1714-80), who wrote idyls and fables which have been translated into German, Polish and Lettish. From 1864 to 1904 the printing of Lithuanian books in Latin characters was forbidden in Russia, so that literary activity was transferred to foreign countries, Chicago, Boston and Shenandoah, Pa., becoming intellectual centers of the Lithuanian people. The flourishing modern literature, which began even before the recreation of the Lithuanian State, deals mostly with national themes. Žemaite (1845-1921) reveals the wretched life of the peasants; Maironis is a master of lyric verse; and Krėvė praises his country's glorious past. A. SE.

BIBLIOGRAPHY.—F. Kurschat, *Grammatik der litauischen Sprache,* 1876; A. Senn, *Litauische Sprachlehre,* 1929.

LITMUS, a coloring matter used in chemistry to detect free acids and alkalis. Blue litmus turns red in an acid solution; red litmus turns blue in an alkali. Litmus may be used either as a liquid or in the form of litmus paper. *See also* INDICATORS.

LIXIVIATION. *See* EXTRACTION.

LITOTES, imparting additional force to what would otherwise be a strong, simple statement by stating the opposite idea negatively, as "he is no mean orator" instead of "he is a great orator."

BIBLIOGRAPHY.—A. Bain, *English Composition and Rhetoric,* 1872.

LITTLE AMERICA, the Antarctic headquarters for the Byrd expedition. On December 25th, 1928, Rear Admiral Richard E. Byrd reached the Ross Ice Barrier with a large expedition, prepared to stay two years. He fixed his headquarters near the Bay of Whales, the calmest site known in the Antarctic. A group of portable buildings was set up for use as winter quarters. It consisted of three main buildings, a number of provision caches, and instrument houses. Two of the principal buildings were constructed in New York City, and the third was made in Norway. In addition to Byrd, the personnel consisted of 41 men, who actually stayed on the barrier; 40 others were connected with the expedition. Three airplanes, radio instruments and three radio towers, one with a beacon, were part of the equipment.

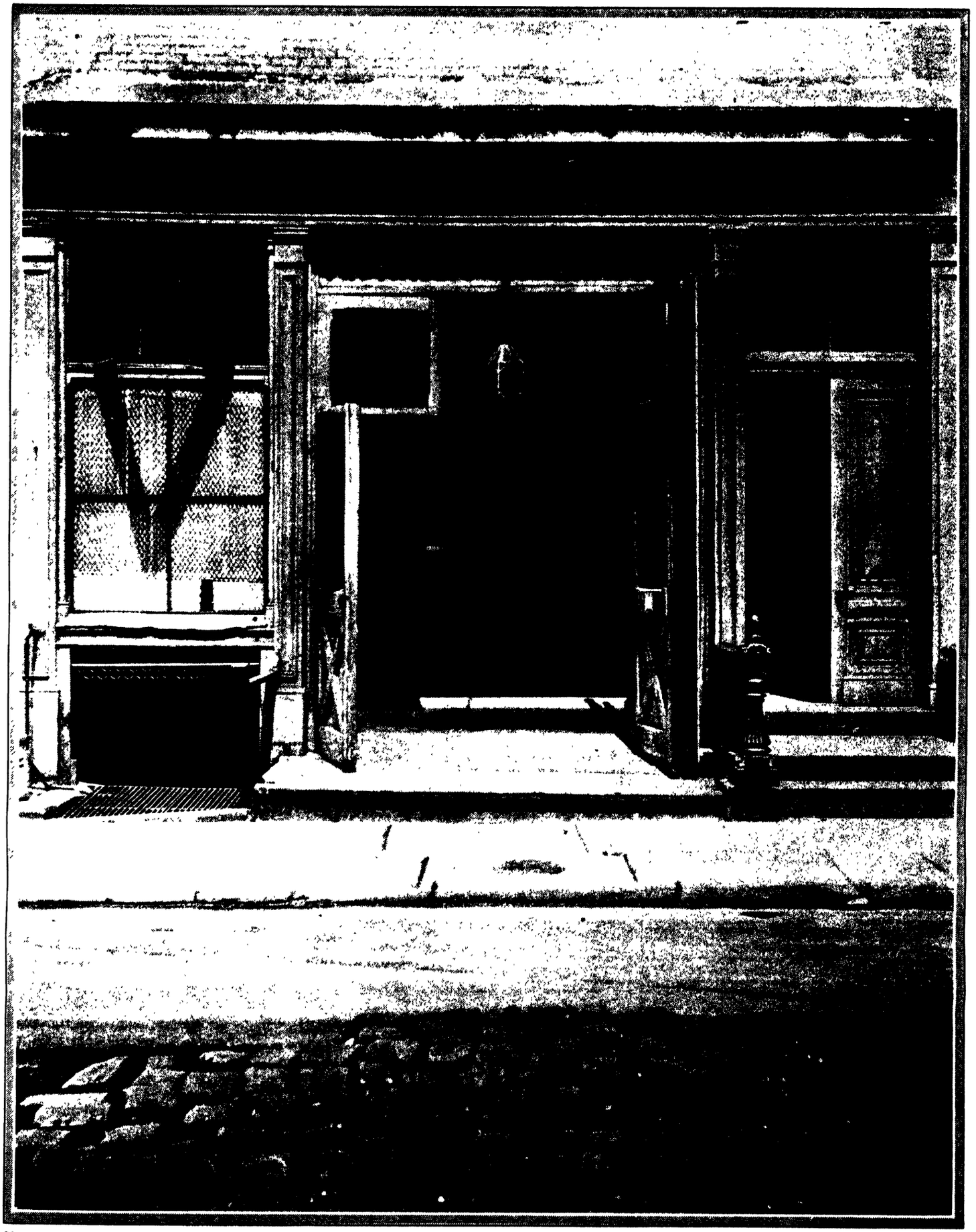
LITTLE BEAR, or Little Dipper, a well-known northern constellation. *See* URSA MINOR: STAR: *map.*

LITTLE DIPPER, or Little Bear, a well-known northern constellation. *See* URSA MINOR; STAR: *map.*

LITTLE ENTENTE comprises three states of central Europe, viz., Czecho-Slovakia, Jugo-Slavia and Rumania. The first two were carved out of the Austro-Hungarian empire, and the third received large accessions of territory as a result of the defeat of the Central Powers in the World War. In 1921, fearful of a Hapsburg restoration in Hungary, they bound themselves by a series of treaties into a defensive alliance to maintain peace and the *status quo* in central Europe.

BIBLIOGRAPHY.—J. O. Crane, *The Little Entente,* 1931.

LITTLE FALLS, a city in central Minnesota, the county seat of Morrison Co., situated on the Mississippi River, 95 mi. northwest of Minneapolis. Bus and truck lines and the Northern Pacific Railroad afford transportation. There is an airport. Little Falls is a trade market for grain and dairy products.



COURTESY KENNETH MACGOWAN, ESQ.

THE PROVINCETOWN PLAYHOUSE

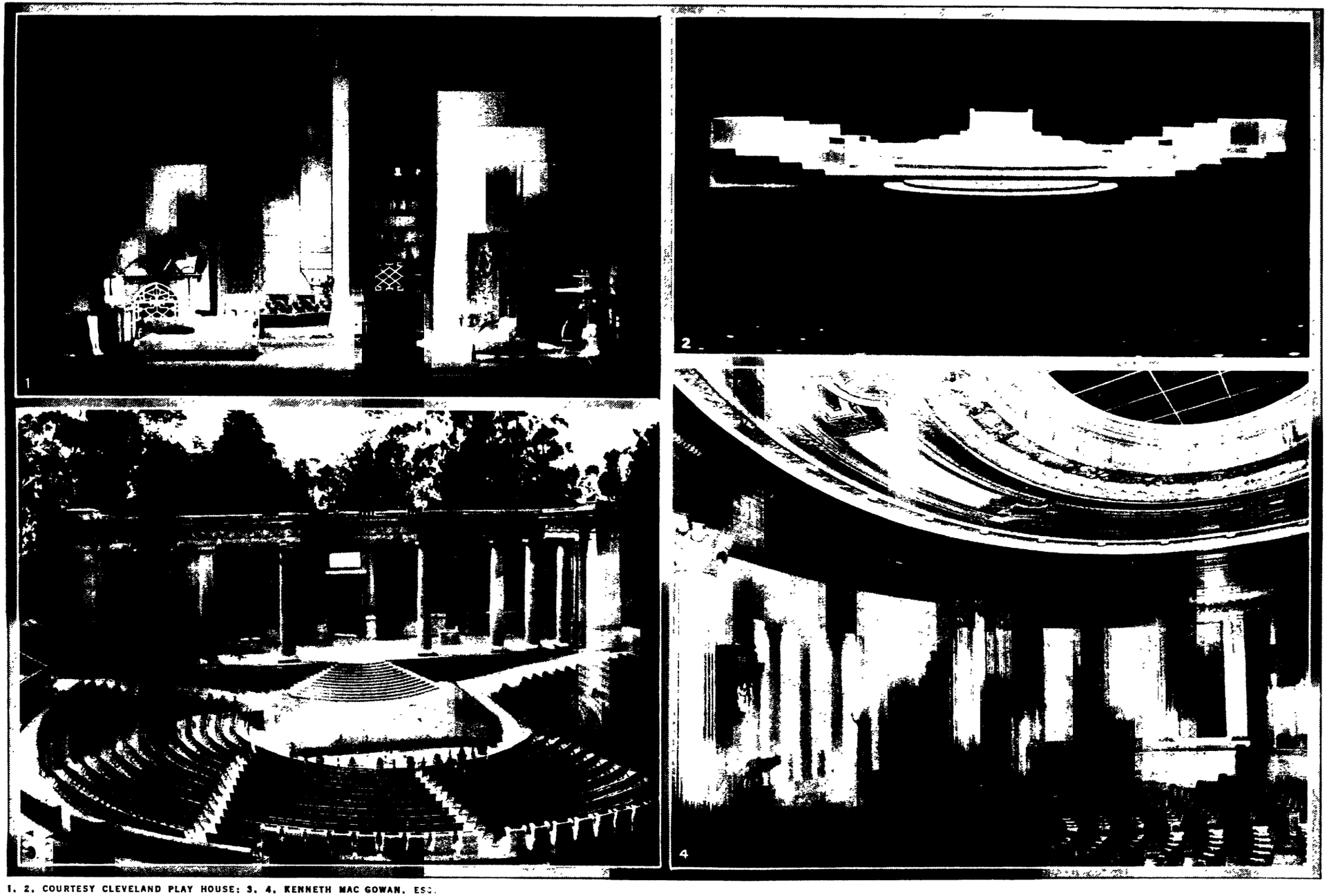
This "Little Theater," in MacDougall Street, New York City, was one of the first of the small playhouses in America to produce experimental plays.



COURTESY THE CAROLINA PLAYMAKERS, UNIVERSITY OF NORTH CAROLINA

THE LITTLE THEATER IN NORTH CAROLINA

The Playmakers Theater at the University of North Carolina is the first state-owned theater in America to be devoted to its own native drama.
1. "The No 'Count Boy," by Paul Green. **2.** The mountain wedding, a scene from "Lighted Candles," by Margaret Bland.
3. Interior of the theater. **4.** The Playmakers Theater; F. H. Koch, director.



1. 2. COURTESY CLEVELAND PLAY HOUSE; 3. 4. KENNETH MAC GOWAN, ESQ.

LITTLE THEATER STAGES AND SETTINGS

1. Arch Lauterer's setting for the Cleveland Play House production of Sophocles' "Antigone." **2.** Setting for "The Fall of Berg-op-Zoom," by Sacha Guitry, at the Cleveland Play House. Design by Frederic McConnell. **3.** The Greek Theater of the University of California at Berkeley. **4.** Theater of the College of Fine Arts, Carnegie Institute of Technology, Pittsburgh, Pennsylvania



COURTESY PASADENA COMMUNITY PLAYHOUSE

A CALIFORNIA COMMUNITY PLAYHOUSE

1. Scene from the first stage production of "Lazarus Laughed," by Eugene O'Neill, as given at the Pasadena Community Playhouse. **2.** Exterior of the Playhouse. **3.** Scene from a musical adaptation of "Turandot," by Carlo Gozzi, presented by the Pasadena Community Players. **4.** Interior of the Playhouse.

A hydro-electric power plant within the city limits and another seven mi. down the river supply power to its machine shops, clothing, pulp, paper and flour mills and various other factories. Pine forests, lakes and rivers are near by. The city was founded in 1858; incorporated in 1889. Col. Charles A. Lindbergh graduated from Little Falls high school in 1918. Camp Ripley, a militia training camp established in 1930, is five mi. north. Pop. 1920, 5,500; 1930, 5,014.

LITTLE FALLS, a city in Herkimer Co., eastern New York, situated on the Mohawk River and the New York State Barge Canal, 22 mi. east of Utica; it is served by the New York Central and the West Shore railroads. The falls in the river, which suggested the name of the city, supply ample hydroelectric power for the industries. There are knitting mills, two large paper mills, bicycle, felt shoe, bookcase and cabinet work manufacturies, hammer works, tanneries, dairy supply and milking machine factories, machine shops, creameries and other industrial plants. In 1929 the approximate value of all manufactured products was $12,000,000; the retail trade in 1929 amounted to $6,372,291 Dairying is the leading interest of the countryside. The municipally-owned, high-pressure, gravity water system gives a never-failing supply of Adirondack Mountain spring water. The site was settled by the German Palatines in 1722, and destroyed by the French and Indians in 1757, but shortly afterwards colonists came again. The village was incorporated in 1811 and made a city in 1895. Close at hand is the grave of the revolutionary general, Nicholas Herkimer. The railroad name of the station on the West Shore Railroad is South Little Falls. In the gorge below the city the waters of the Mohawk River cover numerous potholes of great interest to geologists. One is said to be 150 ft. deep. Pop. 1920, 13,029; 1930, 11,105.

LITTLE NELL (Nelly Trent), the pathetic heroine of Dickens's *Old Curiosity Shop,* published 1840. She is a beautifully innocent and pure-hearted child who lives in constant terror of her grandfather's strange actions and of the threats of the villainous Quilp. Her death is tragic.

LITTLE ROCK, the capital of Arkansas and county seat of Pulaski Co. in the center of the state; it is situated on the Arkansas River, 160 mi. west of Memphis, Tenn. Bus and truck lines, three railroads and small river craft serve the city. The Little Rock airport, costing approximately $250,000, is located here. Oil, gas and coal are the natural resources of the vicinity. Little Rock is a trade market for cotton, grain, and farm- and dairy-produce raised in the region. It is also a manufacturing center for lumber and cottonseed oil products. In 1929 the factory output reached an approximate total of $21,000,000; the retail trade amounted to $46,210,285. The state capitol is situated in a beautiful park, and the state fairgrounds, covering over 200 acres, contain large halls and buildings as well as a capacious grand stand. In Little Rock there are a school for the blind, a home for aged women, several hospitals and many other institutions operated for public welfare. In 1772 Sieur Bernard de la Harpe established a trading post near a rock formation, "La Petite Roche," and the city is named for this point. After Arkansas became a territory the capital was established at Little Rock about 1836. Two beautiful bridges have been built across the river as memorials of the World War. Several state institutions and the United States Veterans' Bureau Hospital are located here. It is the seat of the medical school of the University of Arkansas, the Arkansas Law School and Little Rock College. Pop. 1920, 65,142; 1930, 81,679.

LITTLE SISTERS OF THE POOR, a religious congregation of world-wide distribution for the care of the aged poor. The Augustinian Rule is the basis of its constitutions. Organized in 1839 by the Abbé Le Pailleur in St. Servan, Brittany, the little community was established the next year in its first house, the home of Jeanne Jugan, foundress. The sisters take a special vow of hospitality. They rely absolutely on charitable support, procured chiefly through begging. Their superior is known as the "Good Mother," and the old people they shelter constitute the "Little Family." The only qualifications for admission into their homes are that the candidate shall have reached the age of 60 and be homeless. The total number of houses is 309, of which the majority are in France, including the mother-house in St. Pern, Ille-et-Villaine. The total membership of religious is about 5,700 and approximately 45,000 inmates are provided for.

LITTLE THEATER MOVEMENT IN AMERICA. The so-called "little theater movement" of America is the result of the activities of three types of workers and organizations: first, directors, actors, playwrights and scene designers who could find no easy access to the professional stage and who founded experimental or "art" theaters; second, amateur actors who formed producing groups to supply plays to communities no longer adequately served by Broadway and the touring system; and, third, university teachers and students working in playhouses.

These three types are also to be found in the history of the European theater Max Reinhardt used cabarets and small playhouses to gain an opening which the conventional theaters of his youth denied him. Stanislavsky built up an amateur company into the nucleus of the Moscow Art Theatre, and the Frenchman Antoine followed a similar line. The Abbey Theatre in Dublin utilized amateurs to provide Ireland with plays they otherwise lacked. (*See* IRISH THEATER.) Hauptmann, Chékov, Brieux and Synge gained their first recognition as playwrights through these channels and Granville-Barker, Shaw and Galsworthy won a hearing through experimental ventures. Though educational dramatics have shown little development of late years in Europe, the first English dramas came from the universities, and students in Renaissance schools and colleges on the Continent acted plays when there was hardly any professional theater worth mentioning.

On the whole, the movement in America has been chiefly distinguished by its rapid and wide-spread growth into an institution serving the community, and by the activity of the universities in providing leadership. It is impossible to give accurate figures, but in 1931 there were probably 200 organizations in universities and medium-sized cities making upwards of 1,000 productions, giving opportunities to 10,000 theatrical workers and selling over 1,500,000 tickets during the year. Probably a thousand more groups were doing more spasmodic work. In the high schools 6,000 classes in drama and as many student dramatic clubs were producing almost 25,000 plays and entertaining and educating millions of youthful playgoers.

The beginnings of this movement in America run far back, if one considers the work of amateur dramatic societies, but the first conscious and conscientious efforts towards the creation of a new type of theater center around the year 1912. Among the pioneer organizations must be listed the Wisconsin Players of Thomas H. Dickinson and Laura Sherry, Mrs. Lyman W. Gale's Toy Theatre in Boston, Maurice Browne's Little Theatre in Chicago and the New York Neighborhood Playhouse of Irene and Alice Lewisohn, Helen Arthur and Agnes Morgan. The most famous path-breaker is probably the Provincetown Players, an organization of writers and embryonic actors and directors who, between 1915 and 1930, when they shut up shop, produced the work of a large number of playwrights who would not have been welcomed by Broadway managers; at their head stands EUGENE O'NEILL.

The period of pioneering and radical experiment saw the beginnings of a type of activity which has now superseded the other in importance. This is the development of the community theater. The breakdown of the commercial theater outside New York, and the abandoning of tours to the smaller cities and the one-night-stands opened the way for the amateurs to develop permanent institutions serving playgoers who would otherwise see no plays. These groups soon found not only eager audiences but warm community support. In a large number of cities they found the funds to build playhouses of their own. Some of these—the Cleveland Playhouse, the Pasadena Community Playhouse, the Dallas Little Theatre, the New Orleans Petit Théâtre du Vieux Carré, for example,—are unusually handsome and efficient structures, representing investments of from $100,000 to $300,000. In San Antonio the city built a playhouse and placed it at the disposal of the local little theater. The bulk of the work in these theaters is done without pay, though the best groups all have professional directors, and the trend is toward the professionalizing of the acting companies. The Cleveland Playhouse, directed by Frederick McConnel, employs a dozen professional players, and the Pasadena Community Playhouse of Gilmor Brown is following the same road.

The leader in university dramatics was Prof. GEORGE PIERCE BAKER, first at Harvard and later at Yale. Among his pupils in playwriting were Eugene O'Neill, Philip Barry, Sidney Howard, Edward Sheldon, George Abbott and many others. While Harvard offered no adequate facilities for teaching the work of production, Yale has provided Baker with a splendidly equipped theater in which his pedagogy has broadened out into almost every field of theatrical activity. Since 1913, when Thomas Wood Stevens opened at the Carnegie Institute of Technology the first well-rounded department of the theater in any university, a host of colleges have developed similar work, particularly in the Middle West and on the Pacific Coast. Many give special degrees to their students, and their graduates have gone out to teach in other universities and in high schools, to act and direct in community theaters and to provide an intelligent audience all over the country. *See also* THEATER SCHOOLS; EDUCATIONAL DRAMATICS.

The type of plays presented in the little theaters and at the universities is of a remarkably high grade. Statistics show Shakespeare, Shaw, Kelly, Kaufman, Milne, Barrie, Barry, O'Neill and Ibsen to be their most popular playwrights. Through the work of these theaters, playgoers outside New York, Chicago, Boston, Philadelphia and other large cities are enabled to see more good plays and indeed far finer players than the touring system commonly brought them. K. M.

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LITTLETON, SIR THOMAS DE (c. 1407-81), English jurist and law-writer, was born at Frankley Manor House, Worcestershire, about 1407. He first came into prominence in 1445 as a counsellor, and in 1447 was made sheriff of Worcestershire. His knowledge of law was extensive for his time, and his legal erudition led to his appointment, in 1466, as a judge of common pleas. Littleton was the author of a treatise on *Tenures,* reissued in 1628 with a commentary by Sir Edward Coke. *Coke upon Littleton* was for many years the outstanding work on real property law in England. In 1475 Littleton was made a Knight of the Garter. He died at Frankley, August 23, 1481.

LITTLETON, a town in Grafton Co., northwestern New Hampshire. It is situated in the White Mountains, to which it is the western gateway and is on the Ammonoosuc and Connecticut rivers, 90 mi. north of Concord. It is served by the Boston and Maine Railroad. Littleton is the trade center for the surrounding region and a popular summer and winter resort. A winter sports carnival is held here annually. Littleton was organized in 1784 under the name of Apthorp, later changed to Chiswick and finally to Littleton. Pop. 1920, 4,239; 1930, 4,558.

LITTLE WOMEN, a popular juvenile book by LOUISA MAY ALCOTT, first published in 1868. This is the story of four sisters, Meg, Jo, Beth and Amy

March, who grow up together in a New England village at the time of the Civil War. The daily life and the adolescent joys and sorrows of these four are depicted with faithfulness and charm. Meg, the oldest sister, is the first to marry; the tranquil Beth dies of consumption; Jo, the real heroine, after she sees Amy married to Laurie Laurence, whom she loves, is married to the professor, Teddy Bhaer. This ever-popular story gives a clear picture of Concord, Mass., and is said to be a history of the childhood of Louisa M. Alcott and her three sisters.

LITTRÉ, MAXIMILIAN PAUL ÉMILE (1801-1881), French philologist and philosopher, was born at Paris, Feb. 1, 1801. He began the study of medicine but abandoned it for the study of ancient and modern languages. Littré was an ardent follower of AUGUSTE COMTE and at the latter's death became the head of the positivist school. In 1871 the French Academy elected him to membership. His great work is the *Dictionnaire de la langue française,* compiled in 1863-72. Littré died at Paris, June 2, 1881.

LITURGICAL COLORS, of vestments of the ministers and of drapery decorating the altars, colors prescribed for the office of the day. White is used on Trinity Sunday, the feasts of Our Lord, except those of his Passion, the feasts of the Blessed Virgin, angels, confessors, virgins and women who are not martyrs, and for other joyful feasts and ceremonies. Red, the color of flame and blood, characterizes the week of Pentecost, the feasts of apostles and martyrs and several other feasts. Green prevails as the general color from the octave of the Epiphany until Septuagesima and from the octave of Pentecost to Advent. Custom enjoins violet during Advent and from Septuagesima until Easter, on other days of penitential character and at the blessing of candles and holy water. The priest wears a violet stole at the administration of Penance, of Extreme Unction and in the first part of the baptismal ceremonies. Black naturally expresses sorrow at offices for the dead and on Good Friday. Rose color gives a note of chastened joy only on *Laetare* (Rose Sunday) and on *Gaudete* Sunday. Cloth of gold may supersede white, red and green and cloth of silver may take the place of white. Up to the 4th century, white was the only liturgical color, but soon after others were added. At the beginning of the 12th century, white, red, green and black were general and violet was occasionally employed, although it did not become customary until the 13th century. The symbolism of the colors is obvious, except possibly the green, the color of growing things, which points to the hope of everlasting light.

LITURGY. In the New Testament the word liturgy signifies either a service in the sense of bestowing benefits in general or, in the restricted meaning, the office of the priesthood and the divine service. At present the term comprehends the substances of all regulated worship, and particularly a formulary or book containing the ritual to be followed in public devotions. In ancient times there was no standardized usage, but the later churches took over the liturgy of the mother church from which they sprang. By degrees, however, a tendency toward uniformity became general. Councils and, in the Western Church, the popes promulgated the regulations deemed necessary. In the Eastern Church, the liturgy attributed to Basil the Great was widespread in the 5th century, and in its later form, as abridged by St. Chrysostom, is still in use in the Greek Church. In the Western Church as well, a number of liturgical books, sacramentary, missal, breviary, martyrology, proper epistles and gospels, called "offices," brought about a certain uniformity, in which the Roman form emerged triumphant over the Gallican, Milanese and other liturgies. The Council of Trent, 1545-63, decreed that through the pope alone could the liturgy be regulated. The Protestant reformers reduced it to readings from the Scriptures, prayers and hymns. Martin Luther issued a "German Mass," which retained many features of the Roman Mass, abolishing, however, the use of Latin and the private Mass, and restoring the wine to the communion of the laity. The Calvinists and other denominations rejected almost entirely the liturgical altar service, though of late there has been a tendency to restore it in part. The Anglican Church has, with some omissions and slight changes, retained the Mass as a whole and has consolidated some of the offices of the old Roman breviary in its Book of Common Prayer.

LITVINOV, MAXIM MAXIMOVICH (original name Wallach) (1876-), Russian statesman, was born in 1876 at Bielstock. Joining the Socialists, he was repeatedly arrested, but in 1903 escaped to Switzerland, where he affiliated with the Bolshevists. After the November Revolution Litvinov was the first Soviet representative in London. He was exchanged for Lockhart after having been held as his hostage. He represented Russia in the Geneva and Hague conferences and also at the Moscow Disarmament Conference and in 1927 became People's Commissar for Foreign Affairs.

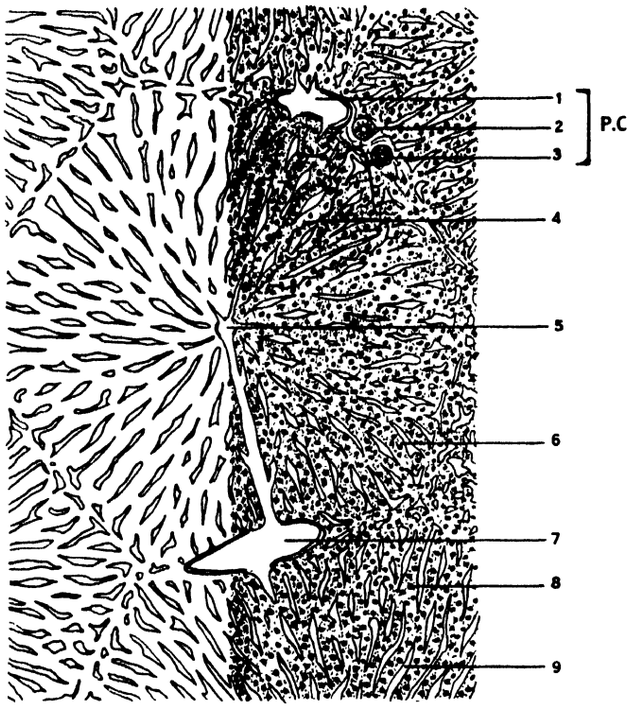
LIVE-FOR-EVER, a name popularly given to various species of STONECROP (*Sedum*), especially to those with large fleshy leaves which live long after being uprooted.

LIVEOAK, a name given in the southern and Pacific states to various evergreen species of OAK, especially to the southern liveoak (*Quercus virginiana*) and its varieties.

LIVER, a large lobular, glandular organ situated at the upper and right part of the abdominal cavity. Its shape is that of a right-angled triangular prism with the right angle rounded off. Its upper and outer surfaces are separated from the thoracic cavity and chest wall by the DIAPHRAGM. Its lower surface is indented for stomach, right kidney, duodenum, and transverse colon. The gall-bladder lies on this lower surface, and here also the bile duct, hepatic artery, and PORTAL VEIN enter its substance.

The liver is composed of an enormous number of identical cells, between which thread a very rich

plexus of blood sinuses. Most of the blood entering the liver comes in through the portal vein. The branches of this vessel in the liver, together with those of the hepatic artery and the bile duct run together in portal canals (*see figure, P.C.*), situated in the corners between the lobules of liver tissue, which are polygonal prisms (*Lob.*). These lobules are composed of trabeculae (*Tr.*) of liver cells separated by blood sinusoids (*Sin.*), all radiating from a central vein (*C.V.*) which occupies the central axis of the lobule.



CROSS SECTION OF A SMALL PORTION OF HUMAN LIVER, AS SEEN UNDER THE MICROSCOPE, SHOWING A LOBULE AND PORTIONS OF SEVERAL CONTIGUOUS LOBULES

P.C., *portal canal;* 1 P.V., *portal vein;* 2 B.D., *bile duct;* 3 H.A., *hepatic artery;* 4 B.C., *bile capillary;* 5 C.V., *central vein;* 6 Tr., *trabecula;* 7 H.V., *hepatic vein;* 8 L.C., *liver cells;* 9 Sin, *sinusoid*

The blood from the portal vein threads through the sinusoids to enter the pentral vein. The central vein of each lobule drains into a hepatic vein (*H.V.*) which carries the blood to the inferior vena cava. The bile secreted by the liver cells is carried out of the lobule to the bile duct in the contiguous portal canal by minute bile capillaries (*B.C.*) formed by complementary grooves on adjacent cells. The small bile ducts join to form the hepatic duct. The gall-bladder forms a large side pocket of the hepatic duct. Between the gall-bladder and the DUODENUM, the bile passage is termed the common bile duct. *See also* EXCRETION. W. J. S. K.

LIVER: As a Food. Veal, beef, pork and sheep livers are used for food. Veal is the most popular and therefore costs the most. All liver is an important source of protein, iron, copper and vitamins A, B and G. Pork liver contains more iron than either veal or beef. Sheep and pork liver are used in the manufacture of certain kinds of sausage. Liver contains a substance which relieves pernicious anemia. *See also* PROTEIN IN FOODS; VITAMINS IN FOODS.

LIVER, CIRRHOSIS OF. *See* CIRRHOSIS OF LIVER.

LIVER, DISEASES OF. The work of the liver is complex and so important that when the organ is removed or seriously injured, death follows quickly. The chief functions of the liver are: (*a*) the manufacture of a digestive fluid known as bile or "gall" (yellow or amber in color), which is poured into the small intestine about seven inches below the outlet of the stomach (the juice is important in the digestion of fat); (*b*) the receiving of products of digestion from the upper intestine and changing them into an "animal sugar," called "glycogen" which is then stored in the liver as a reservoir of energy available to carry on life and meet physical and emotional emergencies; (*c*) to receive and detoxicate poisonous substances carried in the blood from the intestines and to "filter out" and destroy bacteria similarly brought; (*d*) to transform to useful substances, partly digested material brought in the blood from the digestive apparatus and thus salvage them for body service, discharging useless or harmful residues with bile into the intestine; (*e*) to manufacture a substance, which, when poured into the blood, tends to lower blood pressure; (*f*) to pour out and later concentrate in the gall-bladder (a pouch-like sac, the size of a hen's egg, arising from the main bile duct, a few inches below the liver proper) a form of bile, about ten times the strength of ordinary bile, which is rich in digestive substances and which also contains a high proportion of "bile salts," which salts have a definite use as a "natural cathartic."

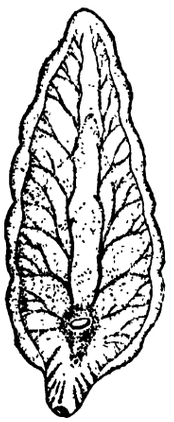
So complex is the work done by the liver that disease can disturb its usefulness in many ways. Its special function in manufacturing bile, in storage of reserve "animal sugar" (glycogen) and its capacity of protecting the body blood from contamination by germs or by poisons from the intestines can be interfered with by stagnation and congestion, where a weak heart fails to insure a free circulation of blood or when an overwhelming infectious disease carries germs or their poisonous products to the liver in quantity greater than the organ is capable of destroying or neutralizing, or when disease of the organs of digestion results in toxic material, suddenly or in excess of normal over a long time-period, passing to the liver in large amount. In such circumstances, there follows, first, enlargement of an overworked organ, then a failure to carry on ordinary work, with the result that abnormal substances pass through the liver into the general circulation and later actually injuring the liver itself. When this last occurs, the liver may be destroyed rapidly (atrophy), with fatal consequences; or, if it is not destroyed, its special tissue is injured, scar takes its place, the liver becomes small and hard (CIRRHOSIS OF THE LIVER) and practically all of the organ's special services are greatly reduced or disappear. The individual becomes a hopeless invalid; pale, sallow or jaundiced (*see* JAUNDICE); his heart and circulation are embarrassed and, in many instances, fluid gathers in the abdominal cavity

("dropsy" or ascites) or the legs and body flesh swell, due to the over-stretched veins "leaking" watery blood elements (EDEMA). Numerous substances, eaten, drunk or inhaled, or passing into the system as result of occupation or emergency, bring about serious liver damage. Examples of such agents are alcoholic beverages, lead, ARSENIC, CHLOROFORM, PHOSPHORUS, MERCURY, CINCHOPHEN, constant exposure to gases derived from gasoline. *See also* ALCOHOLISM; GASES AND ATMOSPHERES, INJURIOUS; LEAD POISONING, etc. F. S.

LIVER EXTRACT: In treatment of anemia. *See* ANEMIA.

LIVER FLUKE, the common name for a species (*Fasciola hepatica*) of fluke (*Trematoda*) which is parasitic in the liver of sheep and sometimes other animals. It causes a serious disease known as liver-rot.

The adult is red-brown or yellow-gray, about an inch long, and shaped like a leaf. It is a hermaphrodite which fertilizes its own eggs, of which it produces hundreds of thousands, which pass down the intestinal tract of the host. If they fall in a damp place they hatch into larvæ (*miracidia*) provided with eye-spots, a boring organ and cilia for swimming. The larva must now discover an appropriate snail, into whose body it bores. Here it changes into a bag-like creature, a sporocyst, which gives rise to many other larvæ of a different form, or rediæ. These, in turn, may produce further organisms like themselves, or tadpole-shaped larvæ, cercariæ. The latter leave the body of the snail and finally make their way to a leaf or blade of grass, where they secrete a cyst about themselves. If the vegetation upon which they are resting is eaten by a sheep, or other mammal, they seek to find the liver, where they develop to maturity. A. I. W.



LIVER FLUKE
Fasciola hepatica

LIVERLEAF, a name given to the species of *Hepatica,* small plants of the crowfoot family, because of the supposed resemblance of the leaves to liver. *See* HEPATICA.

LIVERPOOL, county borough in Lancashire, England, fourth largest city and second seaport in Great Britain, situated on the east bank of the Mersey River.

Site and Buildings. The city is an irregular semicircle with its diameter on the river. In the inner city streets radiate from Canning Place to the periphery and are intersected by concentric circular streets, the radial streets being the chief arteries of traffic. In the dirty side streets and blind alleys the poor live in misery. The inner city is devoted to commerce and public buildings, the entire waterfront is given over to shipping and the rest to dwellings and business. The oldest of the churches is St. Peter's, 1704, and the finest is the huge new cathedral. The leading public buildings are the town hall, 1754, St. George's Hall, 1838-54, the various exchanges, libraries and museums. The principal parks are Princes Park, Sefton Park with Palm House, Wavertree with Botanical Garden and Gladstone Park with monuments. The harbor at the mouth of the Mersey River has about 70 docks and modern facilities. Under its supervision are also the ports of Birkenhead and Bootle. There is a huge floating dock united to the shore by 10 bridges.

Liverpool Cathedral, a great modern church, was begun in 1904 when King Edward VII laid the cathedral's corner stone. The architect was Sir Giles Gilbert Scott. The lady chapel, virtually a separate building, was completed in 1910. The greater part of the choir was finished by 1924, and four years later about one-third of the total length had been built. Completion, expected by 1932, was delayed by the World War, but the construction proceeded according to such a careful plan that the edifice early attained an effect of unity. The cathedral is generally Gothic in style, but marks a revolt against the "Imitative Gothic" of an earlier period. The most notable single feature is the vast unbroken space at the crossing of nave and transepts, "an enormous expanse such as exists in no cathedral in Europe." This assures ample space for great congregations and assemblies. The large choir and presbytery provide a place for daily services, the lady chapel being used for small meetings. The internal length of the cathedral is 480 ft.; externally, with the lady chapel, 619 ft. The choir, 47 ft. wide, has greater breadth than that of any existing church in England, and the height, 116 ft., also surpasses that of other English churches. The edifice, built of native stone and facing north and south, is admirably situated above the city.

Manufactures. Industry is subordinate to commerce and consists in the improving of imported raw materials and supplying the needs of shipping. There are also cotton, linen, sugar, tobacco and machine factories, foundries, oil presses, distilleries and minor industries.

Shipping and Trade. Liverpool is the chief port for Great Britain's transatlantic shipping, as it is favorably situated in regard to England's industrial center as well as in regard to the supply of raw materials from America. There are 32 shipping companies, among them the Royal Mail, White Star Line and Cunard with regular sailings to America, Ireland, southern Europe, India, China and West Africa.

Transportation. Liverpool is an important railroad center with large stations in the inner city and express trains in all directions. The city has suburban and street railways and buses, as well as two subways to the docks. Two tunnels under the river unite Liverpool and Birkenhead.

Educational Institutions. Since 1903 Liverpool has had a university with several institutes and a school for tropical hygiene, Tidal Institute, since 1919, and several higher and technical schools. There are various large and smaller libraries, learned societies, museums and art galleries. Charitable institutions

are numerous, with special consideration to seafaring men and their widows and orphans.

History. Liverpool, also called Litherpool in ancient documents, was first mentioned in 1190. It received its first charter in 1207 and the second in 1229. It began to flourish in the 18th century as a result of the slave trade, of which it was the center, together with the industrial development of the hinterland, especially after the introduction of steam power. The port retained its standing in the 19th century due to the cotton trade and its trade with the United States in general. Pop. 1921, 805,046; 1931, 855,539.

LIVERPOOL, UNIVERSITY OF, a coeducational university, situated on Bromlow Hill, at Liverpool, England. It was founded as University College in 1881 and was incorporated with the UNIVERSITY OF MANCHESTER from 1884-1903, when it became an independent university. Besides faculties of arts, sciences, medicine, law, engineering and commerce, it has numerous special schools, including those of social science, architecture, tropical medicine, town planning, industrial chemistry, civil engineering, metallurgy, hygiene, dental surgery and international law. The University Extension is a strong feature, and the Tidal Institute, 1919, is noted. The institution is well equipped with laboratories, museums and a library and has an ambitious building program. The annual enrollment totals approximately 2,500 students. In 1931 the chancellor was the Rt. Hon. the Earl of Derby.

LIVERWORTS, a division of the bryophytes, and differing from the tree mosses in being thallus plants. They live in water or on moist soil, the mature plant consisting of a usually flat, forked, green or greenish thallus. The plant has no stem, root or leaves, the familiar green patch on moist ground, being attached to it by fine, root-like hairs, the rhizoids. One of the commonest liverworts is *Marchantia* which grows nearly all over the world in moist shady places. It often reproduces asexually by outgrowths of the thallus, but, like most liverworts, reproduction is usually by spores, and the life history is complicated. In the alternation of generations, which characterizes all the sexually reproduced liverworts, the sporophyte in one of the stages lives parasitically upon the gametophyte. The name liverwort is also applied to a common wild flower, the HEPATICA. *See* ALTERNATION OF GENERATIONS. N. T.

LIVING, COST OF. *See* COST OF LIVING.

LIVINGSTON, EDWARD (1764-1836), American jurist and statesman, was born at Clermont, N.Y., on May 26, 1764. After graduation from Princeton, he studied law in New York and Albany, and was admitted to the bar in 1785. He was a federalist member of Congress from New York, 1795-1801, was appointed United States attorney, and in the same year, 1801, was elected Mayor of New York. A dishonest clerk in his office of United States attorney involved him in financial difficulties. Eventually he paid all losses with interest, but he resigned from office, and in Dec. 1803 went to New Orleans, where in 1804 he became a member of the bar. In 1820 he was elected to the Louisiana Legislature, and was commissioned with two others to prepare a civil code for the state. From 1823 to 1829 he served in Congress, and was then elected to the United States Senate. In 1831 President Jackson appointed him Secretary of State. In 1833 he was made Minister Plenipotentiary to France, to request $5,000,000 indemnity, in settlement of spoliation claims, which he secured. He returned in 1835, and died on May 23, 1836, at Montgomery Place, Dutchess Co., N.Y.

LIVINGSTON, ROBERT R. (1746-1813), American statesman, was born at New York City on Nov. 27, 1746. He was graduated in 1765 from King's College, and after studying law was admitted in 1773 to the bar. He began practicing in partnership with John Jay. As a member of the Continental Congress, 1775-77 and 1777-79, he helped draft the Declaration of Independence, but was not one of the signers. In 1777 he helped to draw up the New York State Constitution. He became the first chancellor of the state in 1801, one of the duties of the position being the administration of the oath of office to Washington. As president of the state convention in 1788 he used his influence for the ratification of the Federal Constitution. Although he declined to be minister to France under Washington in 1794, he accepted the position under Jefferson in 1801, negotiating, together with James Monroe, the LOUISIANA PURCHASE. He had, besides politics, interests in science and agriculture. He shared in the investigations of John Stevens and Robert Fulton in the science of steam navigation, securing for Fulton and himself the state monopoly. He carried on scientific agriculture by sheep-breeding and the use of gypsum fertilizer. As a result of his experimentation he published *Essay on Agriculture* and *Essay on Sheep.* He died Feb. 26, 1813.

LIVINGSTON, a city in southern Montana, the county seat of Park Co., situated on the Yellowstone River, 100 mi. southeast of Helena. It is served by the Northern Pacific Railroad. There is a landing field. Livingston is a gateway to Yellowstone National Park, surrounded by beautiful country, and popular as a summer resort. Grain and live stock are raised, and coal and valuable metals are mined in this region. Livingston was founded in 1879; incorporated in 1888. Pop. 1920, 6,311; 1930, 6,391.

LIVINGSTONE, DAVID (1813-73), Scotch missionary explorer, was born at Blantyre, Lanarkshire, Scotland, Mar. 19, 1813. When he was a young boy and until he was about 24, he worked in a cotton mill. An interest in missionary work led to his being sent to Africa by the London Missionary Society in 1840. He soon began exploring the country and in 1849 discovered Lake Ngami, the river Zambesi in 1851 and the Victoria Falls in 1855. Returning to England in 1856, he gave up his official connection with the missionary society and published his book *Missionary Travels.* From 1858 to 1864, he was consul at Quilimane in Africa, and led an expedition

which discovered Lake Nyassa in 1859. Livingstone again went to England in 1865, and published his *Zambesi and its Tributaries.* The Nile basin was his objective on his return and on this journey he suffered intensely and stoically. At length exhausted at Ujiji, he was found and rescued by Henry M. Stanley, who had been commissioned in 1871 to search for him. Livingstone insisted on going on and started his last journey to discover the sources of the Nile, which ended in his death at Ilala, on Apr. 30, 1873. His body was taken to England by his faithful followers and entombed in Westminster Abbey *The Last Journals of David Livingstone* was published in 1874.

LIVIUS ANDRONICUS (c. 284-204 B.C.), Latin poet and dramatist, was born probably at Tarentum, about 284 B.C. He was of Greek parentage, but was taken to Rome as a slave. M. Livius Salinator freed him and gave him his own name. The plays of Livius are both comedies and tragedies. He was instrumental in introducing Greek language and literature to the Romans. He taught both Greek and Latin. Livius is also called the founder of Roman epic poetry and drama. His translation of the Greek play given at the *ludi Romani* in 240 B.C. was the beginning of Roman dramatic literature. He acted in his own plays, the words being sung by a boy. He was asked to write poems on several public occasions; one of these was the hymn of thanksgiving for the victory of the Metaurus. He died in 204 B.C.

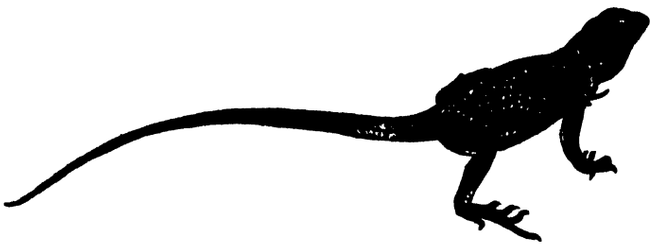
LIVONIA. *See* ESTONIA, HISTORY OF.

LIVRE, an old French monetary unit and coin which was replaced by the FRANC; also a unit of weight used until the introduction of the METRIC SYSTEM. The ratio of exchange between the franc and livre was 80 to 81. The livre of weight was about equal to a troy pound.

LIVY (Titus Livius) (59 B.C.-17 A.D.), Roman historian, was born at Patavium (Padua). After receiving a thorough education, he came to Rome, where he made the acquaintance of the greatest men of his time. Despite his openly avowed republican sympathies, he enjoyed the friendship of the emperor Augustus himself. Livy does not seem to have held any public office throughout his life, but devoted himself exclusively to literature. He died, highly esteemed, in his native town.

Livy's great work was his *History of Rome,* covering the period from the foundation of the city down to the death of Drusus, in 9 A.D. Of the original 142 books, only 35 are preserved, namely Books I-X and XXI-XLV. Besides these, we have a few fragments, and a brief epitome of the lost books. An intense patriot, Livy's purpose in writing his monumental history was to evoke for the Romans of the degenerating present the ancient glories of their past, and thus to re-awaken in them their flagging patriotism. Although it is marred by some inaccuracies and errors, it has been the chief source of information concerning the period with which it deals.

LIZARD, the popular name for members of a sub-order (*Lacertilia*) of reptiles. The lizards and snakes, which together form the order *Squamata,* are the most widespread of modern reptilian groups. The majority of lizards have slender bodies, four legs, and a long tail, but some species, like the GLASS SNAKE and BLIND WORM are elongate and legless. On the other hand, the "horned toads" have wide,



COLLARED LIZARD

flattish bodies with relatively short tails. There are about 2,500 species, ranging in size from animals a few inches long to the big "dragons" (*Varanus komodœnsis*) of the East Indies which are some 10 ft. in length. The largest number of species live in the tropics; some forms, however, are found in temperate regions, where they hibernate during the winter.

Lizards have become adapted to various environments. Many terrestrial forms inhabit arid or desert regions; forms like the glass snake are burrowers; some species, such as the flying dragon (*Draco volans*), which wears volplanes at its sides, are arboreal; and at least one species, the Galapagos sea-lizard (*Amblyrhynchus cristatus*) is amphibious. Many lizards prey on insects, others are vegetarians, and some are carnivorous. They are, generally speaking, exceptionally rapid in their movements, although some, like many iguanas and the gila monster, are sluggish. The latter is the only poisonous lizard. Its bite is seldom, if ever, dangerous to man.

Their tails are very important defensive instruments to many lizards. Some of the more powerful species use them as weapons in fighting; other forms when especially hard pressed, or if seized by an enemy, can break off their tails and leave them wiggling in the grasp of their pursuers, while they themselves make their escape. New tails, in time, replace the lost members. Most lizards lay eggs, but a few bear their young alive. A. I. W.

LIZARD'S-TAIL (*Saururus cernuus*), a perennial herb of the lizard's-tail family (*Saururaceæ*), closely allied to the peppers. It is found in swamps and shallow water from Rhode Island to Ontario and Minnesota, southward to Florida and Texas. The slender, erect, sparingly branched stem grows 2 to 5 ft. high, bearing dark-green, heart-shaped leaves and small, fragrant, white flowers in a narrow, nodding, tail-like spike.

LJUBLJANA. *See* LAIBACH.

LKUNGEN, the name given to themselves by the SONGISH, a North American Indian tribe of the Salishan linguistic stock.

LLAMA (*Lama glama*), a member of the camel family domesticated in the Andean countries of South America. Llamas have been in domestication for many centuries, having been used as beasts of burden by the Peruvians before the Spanish invasions. They have been derived from the guanaco, a member of the same family still found wild in South America. The llama, however, is larger than the guanaco, standing nearly 5 ft. at the shoulder and is able to carry a load of about a hundred pounds. The long, shaggy, woolly coat is cream white or brown-spotted; this wool is spun into clothing by the natives of southern Peru and Chile. The flesh is edible. When angry, the llama, like other members of the family, ejects saliva of a most objectionable odor at its tormentor's face. Like camels, they lie down when overloaded or when they consider they have worked long enough, and no persuasion can force them to go on. During the Spanish conquest, llamas transported vast quantities of silver and other valuables, but since the introduction of horses and mules they are less used as beasts of burden. Llamas have never been acclimatized outside South America.

LLANELLY, a seaport of Carmarthenshire, Wales, lying on the Lliedi at the estuary of Burry River, an inlet of Carmarthen Bay, about 179 mi. west by north of London. Of ancient origin, it is of wholly modern appearance. As a lead-smelting and shipbuilding center, it became important after the Industrial Revolution, and in 1847 tin-plate manufacture was introduced. In Llanelly there also are potteries, iron foundries and copper and chemical works. Extensive docks line the Burry which, because of silting up, has had to be deflected to a deeper channel. Pop. 1921, 36,520; 1931, 38,393.

LLANOS, the term employed in regions of former Spanish occupation to designate any prairielike plain. In a strict sense it applies to the great Llanos del Orinoco in South America, lying principally in Venezuela with extensions into Colombia. These low-lying, treeless grasslands stretch from the Orinoco to the Coast Range, extending over 150,000 sq. mi.

During the dry season, lasting more than half the year, the llanos relapse into dusty barrens, except in parts, called *llanos bajos,* which are flooded during the rains. Between June and October they support a luxuriant growth of grass. The scattered inhabitants, the *llaneros,* of mixed Spanish and Indian blood, are chiefly occupied in grazing. The llanos resemble the Brazilian campos, the pampos of Argentina and the plains of Texas.

LLOYD GEORGE, DAVID (1863-), British statesman, was born Jan. 17, 1863, in Manchester, England, his parents being natives of North Wales. His father, a schoolmaster in very humble circumstances, died when he was three years old, and an uncle, Richard Lloyd, shared the responsibility for his rearing. He grew to manhood in the village of Llanystumdy, North Wales, and became a lawyer in that region, noted for his championship of liberal causes. In 1890 he was elected to the House of Commons by the Liberals, and soon became noted for his stinging attacks on Chamberlain and other Conservative leaders. Many kinds of liberal measures received the whole-hearted support of his dynamic personality. His opposition to the Boer War, while it made him many new enemies, brought him very prominently into public notice, and marked him as a man of powerful and independent character. In 1906 he entered Campbell-Bannerman's liberal cabinet as president of the board of trade.

He became chancellor of the exchequer in 1908 and the following year introduced his famous "war budget." This measure, which he said was intended to provide funds for war against poverty and to make it "as remote to the people of this country as the wolves which once infested its forests," and which consisted chiefly of increased taxes on luxuries, incomes and land, met the violent objection of the conservatives. It passed the Commons but was defeated by the Lords. After a new election in 1910 had upheld the government, the budget was sullenly adopted by the Lords. The same year Lloyd George's influence was instrumental in securing the passage of the Parliament Bill, which greatly curtailed the power of the upper house.

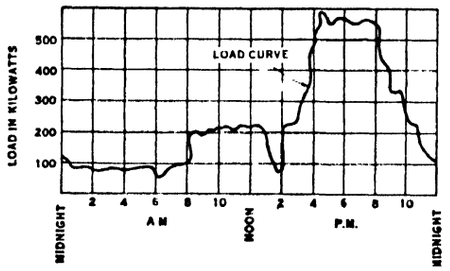
At the beginning of the World War he expressed himself as strongly convinced of the righteousness of England's participation. He was placed at the head of the new ministry of munitions and also given the task of increasing the voluntary enlistment of the army. He favored the Conscription Act of 1916 and in June of that year became prime minister at the head of a coalition government. England's vigorous prosecution of the war was continued, with an inner council of the cabinet, of which Lloyd George was the chief member. After the armistice he dissolved Parliament and again carried the country in for the coalition government in what is known as the KHAKI ELECTION. At the Paris Peace Conference, Clemenceau, Wilson and Lloyd George were the dominant figures. In the unrest following the war the popularity of the government waned rapidly, but Lloyd George's great influence kept the coalition in power until 1922, when he was defeated and the conservatives returned to power. As the leader of the liberal opposition, his rôle was greatly diminished because the Labor Party had increased its membership above that of the liberals in the Commons and therefore took the place of the opposition party. In two successive elections since, Lloyd George's following has steadily decreased and with it, his influence in Parliament and the nation.

R. W. P.

LLOYD'S REGISTER OF SHIPPING, a non-commercial organization which surveys and classifies mercantile ships throughout the world and publishes statistics and rules of construction for such vessels. This society is credited with having established world-wide standards for mercantile shipbuilding. Lloyd's Register of Shipping is managed by a committee of 75 chosen by shipping interests in London where its headquarters are located. There are also committees

in Glasgow and Liverpool with representative committees in the United States, France, Sweden, Holland and Japan. The society originated in the coffee house of Edward Lloyd in the early 18th century and was reorganized in its present form in 1833.

LOAD FACTOR, in electrical engineering, is defined by the American Institute of Electrical Engineers as follows: "The load factor is the ratio of the *average power* to the *peak power.* In each case, the interval of maximum load and the period over which the average is taken, should be definitely specified, such as a 'half-hour, monthly' load factor. The proper interval and period are usually dependent upon local conditions and upon the purpose for which the load factor is to be used."



ONE-DAY LOAD CURVE FOR ELECTRICAL SYSTEM

A typical load curve for one day is shown in the accompanying figure. The "half-hour" load factor for that day would be the average value of the load for the entire day divided by the average load for the half hour from 4 P.M. to 4.30 P.M.

LOADSTONE. *See* LODESTONE.

LOAM, a fine-grained, easily worked soil, rich in humus or disintegrating vegetable matter, with a mixture of roughly equal parts of sand and clay. According to Bailey, a soil containing not less than 40% and not more than 60% of sand, plus humus, is properly classed as loam.

Many types of loam are recognized. When the proportion of sand rises, the soil is referred to as a sandy loam. When it drops, the soil becomes a clay loam. The admixture of coarser or finer soil particles produces other variations, as gravelly loam, stony loam, silty loam. In soil surveys loams are treated under local names, as Hartford sandy loam.

The term loam applies to the physical properties and texture of the soil rather than to its chemical constituents. Loams are more friable than clay soils, and less likely to bake out. On the other hand, their water-holding capacity is greater than that of sand soils. This property is increased by the presence of humus. The vegetable matter also favors the development of nitrogen-fixing soil organisms, quickens chemical action, facilitates the aeration of the soil and tends to modify extremes of soil temperature.

LOAN. *See* MONEY-LENDING; USURY.

LOAN-WORD, a word borrowed by one language from another. Since probably no language is pure in the sense that it has received nothing from without, loan-words form a more or less important component of every vocabulary, English, for instance, having added to its Germanic foundation accretions from French, Latin, Greek, Italian, Spanish, Russian, Arabic, Modern and American Indian, Chinese, Malay, and many other sources. The number of borrowings may be very high, Classical Armenian, for instance, having at least 77.42%.

The vocabulary of any given language consists of two categories of words: native and foreign, the latter subdivided into alien and naturalized. Native words are those which belong, so far as traceable historically, to that linguistic stock which has become dominant in a given area (as English *cow,* cognate with Latin *bov-,* "ox, cow"); alien words still retain their foreign appearance, with only such change as is absolutely necessary to adapt them to their new surroundings (as English *bovine* from Latin *bovinus,* "relating to an ox or cow," from Latin *bov-*); naturalized words, although borrowed, have become so assimilated to the language adopting them that they are no longer generally felt to be alien, and are subject to all PHONETIC LAWS which become operative subsequent to the time of their adoption (as English *beef* from French *bœuf* from Latin *bove*^{m}).

Words may be borrowed from the same source at different times, thus giving rise to "doublets," and even "triplets," etc., one of a pair usually being naturalized, and the other alien, as English *priest: presbyter; fashion: faction; frail: fragile; palsy: paralysis;* for "triplets," *leal: loyal: legal; sir: sire: senior;* for a "quadruplet," *dish: desk* (through Danish): *disc: discus.*

Here also belong "translated terms," as English *gospel,* Anglo-Saxon *god-spel* "good tidings" = Greek *euangelion* (cf. English alien *evangelical*); German *fern-sprecher,* "far-speaker" = English *tele-phone.*

Words are borrowed either because they denote concepts or things new to, or hitherto unexpressed by, the borrowers; or because they are regarded as marks of higher cultivation and refinement; or to serve as EUPHEMISMS, the foreign term being less generally intelligible and, therefore, less vulgar. L. H. G.

LOBBY, in legislature, a group which exerts pressure upon legislators for the purpose of obtaining laws that will benefit or cater to special interests. Because lobbying is so often accomplished by secret threats, deals or brow-beating, the word is usually applied in a derogatory sense, although there are lobbies which are legitimate and perform a useful service of informing the law-makers. Congress has not followed the example of some of the states in regulating lobbying, despite the fact the evils are most pronounced in the framing of tariff acts.

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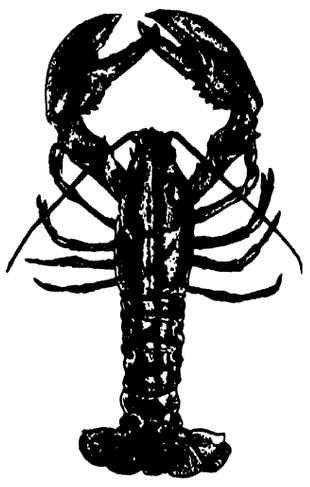
LOBELIA, a genus of annual or perennial herbs of the lobelia family comprising many ornamental and medicinal plants. There are about 250 species widely distributed in temperate and tropical regions, some 25 of which occur in North America chiefly in the eastern

and southern United States. They are mostly herbs, though some tropical species are slightly woody, bearing alternate leaves and irregular, often two-lipped, sometimes very showy flowers in long, narrow, terminal clusters. Among the best known North American species are the cardinal flower (*L. cardinalis*), the great lobelia or blue cardinal flower (*L. syphilitica*) and the Indian tobacco (*L. inflata*), of eastern North America, and the red lobelia (*L. splendens*) of the southern and western states. Several exotic species are grown in gardens.

LOBLOLLY BAY (*Gordonia Lasianthus*), a handsome evergreen tree of the tea family called also black laurel. It is found in swamps and low woods in the southern United States and is sometimes planted for ornament. The tree grows from 40 to 75 ft. high bearing smooth, oblong, leathery leaves and large, spicily fragrant, white flowers, 2½ in. across, beginning to blossom in July and continuing to open for two or three months.

LOBO, FRANCISCO RODRIGUEZ (c. 1560-1636), Portuguese poet, was born in Leiria, between 1560-65, of noble family. He studied law at Coimbra. Returning to Leiria, he was subsequently banished for making love to his pupil, a nobleman's daughter. His first publication was *Romance,* 1596. *O Condestaore,* a poem in 20 cantos, is considered among his best works. His *Corte n'aldeia,* 1619, was received with immense enthusiasm and is still much read by students of Portuguese. Lobo was drowned in the Tagus in 1636.

LOBSTER, the popular name for members of a family (*Homaridae*) of crustaceans. There are three species of true lobsters. The largest is the American form (*Hormarus americanus*) which lives along the Atlantic coast from Labrador to Cape Hatteras and may weigh as much as 34 lbs. Considerably smaller is the European lobster (*Homarus gammarus*), found from Norway to the Mediterranean, and smallest of all is an African species which occurs around the Cape of Good Hope.



LOBSTER

Like most crustaceans, lobsters are completely clothed in shell armor, which must be moulted periodically, as it cannot grow with them. The shell is usually blackish blue in color, becoming red upon boiling. Lobsters have two large claws; one that is thick and heavy is used for crushing things, while the other more slender and sharp-toothed fish claw is employed for seizing and holding. There are four pairs of walking legs, the first two of which are provided with pincers.

Usually lobsters walk about the bottom of the sea, in shallow places, but on occasion they can dart rapidly backward through the water, by violently doubling up their bodies. The female carries her eggs, of which she lays many thousands, glued to the paddles under her abdomen or tail. They hatch into big-headed larvae (*mysis*), that swim at the surface of the sea, and only settle down after a succession of moults, during which they grow continually more like the adult.

Lobster meat is commonly regarded as a great delicacy. There are important fisheries in Europe, Canada and the United States, where about 70% of the catch is taken off the coast of Maine. Wicker traps, baited with dead fish, are generally used. Several other large edible crustaceans, not true lobsters, are popularly called lobsters. Chief among them are the rock lobster, the familiar French *langouste* (*Palinurus vulgaris*), which has relatives on the Pacific coast of North America, Australia and New Zealand; the Norway lobster (*Nephrops norvegicus*) that lives in relatively deep water; and the Murray lobster (*Astacopsis spinifer*), a large Australian crayfish.

In 1929 the commercial catch of lobsters in United States waters, about 90% of which were taken on the New England coast, amounted to 11,747,000 lbs., valued at $3,508,000. *See also* CRAYFISH. A. I. W.

LOCAL GOVERNMENT. The purpose of local governments is two-fold. They serve as agencies for carrying out state functions and likewise fulfill certain local needs. Some units of local government are mere administrative divisions of the state (the *Regierung* in Prussia), but usually both purposes are served by the same unit (the English and American county, the French *département,* the Prussian *Kreis*). The principal units of local government in the United States are the town or township, the village or borough, the city and the county. (*See* CITY-COUNTY GOVERNMENT.) All are mere creatures of the state and, except for limitations in the state constitution, may be set up and abolished at will by the legislature.

T. H. R.

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LOCARNO TREATIES, a series of interlocking security pacts relating to the eastern and western frontiers of the German Republic, signed at Locarno, Switzerland, on Oct. 16, 1925, and signed at London, Dec. 1, 1925, by representatives of Germany, Belgium, France, Great Britain, Italy, Poland and Czechoslovakia. This progressive step in the direction of international harmony was proposed by the German Foreign Minister, Gustav Stresemann, following England's announcement that she would not ratify the Geneva Protocol for the Pacific Settlement of International Disputes adopted by the League of Nations Assembly on Oct. 2, 1924.

The Locarno agreements include a security treaty between Germany, Belgium, France, Great Britain and Italy; four arbitration conventions, between Germany as the party of the first, and Belgium, France, Poland and Czechoslovakia as the parties of the sec-

ond; and two special treaties between France and Poland, and France and Czechoslovakia.

The first document, known as the Treaty of Mutual Guarantee, guarantees "the maintenance of the territorial *status quo* resulting from the frontiers between Germany and Belgium, and Germany and France," and the continued demilitarization of the 50-kilometre zone east of the Rhine as stipulated in the Versailles Treaty. It further provides that the signatories will in no case resort to war against each other except in "legitimate defence," in order to carry out a league decision, or in case the Council of the League fails to reach an unanimous decision on a dispute submitted to it for settlement. In the event that one party to the agreement commits a "flagrant violation" of its terms, the remaining contracting parties undertake "immediately to come to the help of the party against whom such a violation or breach has been directed" provided that such immediate action be required "by reason either of the crossing of the frontier, or the outbreak of hostilities, or the assembling of armed forces in the demilitarized zone."

Thus each of the powers concerned is guaranteed against attack or invasion, and all of them undertake "to settle by peaceful means . . . all questions of every kind which may arise between them and which it may not be possible to settle by the normal methods of diplomacy."

The group of arbitration conventions provides for especially appointed Permanent Conciliation Commissions which are to deal with disputes arising between the signatory parties, that is, between Germany and Belgium, or Germany and Poland, etc. In the event that any such Commission fails to settle a dispute amicably, the latter may be referred to the Permanent Court of International Justice or to the League Council. It will be noted that England and Italy did not sign such arbitration conventions.

The remaining two treaties, those between France and her allies, merely provide that these states will lend one another reciprocal military aid in case of attack "without provocation." The entire set of treaties was to go into force upon the entrance of Germany into the League of Nations.

The importance of the Locarno agreements was perhaps more psychological than actual. Thus, the actual degree of security of the Polish-German boundaries remains very much in doubt, and it is problematical what the duty of the remaining signatories would be if France attacked Germany in the Rhineland in the event that Germany declared war on Poland or Czechoslovakia. However, on paper at least, France did agree to give up all future hope of extending her boundaries to the Rhine or of again occupying the Ruhr or any other German region, and Germany definitely abandoned hope of ever regaining Alsace-Lorraine. Moreover, the "Locarno Spirit" greatly improved European international relations during a highly critical period, and considerably hastened German's entrance into the League Sept. 8, 1926. W. C. L.

LOCHINVAR, in Scott's poem, *Marmion,* published 1808, a dashing young cavalier in love with the unhappily married lady of Netherby Hall. At a ball he asks his lady to dance with him; but instead of dancing Lochinvar swings his fair partner into his saddle and spectacularly rides off with her.

LOCH LOMOND. *See* LOMOND, LOCH.

LOCKE, DAVID ROSS (1833-1888), American humorist, better known as Petroleum V. Nasby, was born in New York City, Sept. 20, 1833. In 1860 he began contributing to the *Findlay Jeffersonian* a series of letters supposedly written by an impoverished and stupid Democrat who aspired to better living through a postmastership, whiskey and continued slavery, signing himself as "Petroleum V. Nasby." In character, these letters proved useful in supporting Lincoln's war policies. When Locke became editor of the Toledo, O., *Blade* in 1865, the letters continued to appear there. Later he collected and published them under the titles *Swingin' Round the Cirkle* and *The Struggles of Petroleum V. Nasby.* The author was also a popular lecturer. Locke died in Toledo, O., Feb. 15, 1888.

LOCKE, JOHN (1632-1704), English philosopher, was born at Wrington, Somerset, Aug. 29, 1632. At the age of twenty he entered Oxford and in 1667 went to live in Exeter House with the Earl of Shaftesbury. Due to political misfortunes he was forced to retire to Holland in 1683, but after the Revolution of 1688 he was again in good standing at home. His later years were devoted chiefly to writing and controversy. In 1690 he published his celebrated *Essay Concerning Human Understanding,* in 1693 appeared the *Thoughts on Education,* and in 1685 were begun his *Letters on Toleration.* The *Two Treatises on Civil Government,* 1690, were written to justify the Revolution of 1688. Perhaps no philosopher has exerted a greater influence on his time than did John Locke. A champion of religious toleration and a defender of political revolution, he was a great liberalizing force. His first *Treatise on Government* smashed as completely the doctrine of the divine right of kings as did the first part of his *Essay* kill for all time the doctrine of innate ideas. The father of British empiricism, he set in motion trends of thought that culminated in the philosophy of KANT. Though now somewhat discredited, his educational ideas were responsible for the theory of formal discipline which held sway in schools for so long a period. A defender of the compact theory of the State and the doctrine of natural rights, his ideas found fruit in the American Revolutionary and Constitutional periods. He died at Bates, Essex, Oct. 28, 1704.

LOCKE, WILLIAM JOHN (1863-1930), English novelist and playwright, was born Mar. 20, 1863, at Georgetown, Demerara, British Guiana. He was educated at the Queen's Royal College in Trinidad and at St. John's College, Cambridge. He studied architecture and held several important offices in architectural societies. In 1895 he published his first novel, *At the Gate of Samaria.* Since then he wrote many

books of great popularity, both as novels and as plays. Among them are *The Morals of Marcus Ordeyne,* 1905, *The Beloved Vagabond,* 1906, *Stella Maris, The Wonderful Year, The Mountebank, The Great Pandolf.* His original plays include *Mr. Cynic* and *The Lost Legion.* Locke died May 15, 1930.

LOCKHART, JOHN GIBSON (1794-1854), Scottish writer, was born at Cambusnethen, Scotland, July 14, 1794. He was educated at the University of Glasgow and at Oxford. His career began in 1817, when *Blackwood's Magazine* was established and his authorship of the attacks upon COLERIDGE, HUNT and JOHN KEATS published there has been both affirmed and denied. In 1820 he married Sophia, daughter of SIR WALTER SCOTT, and in 1825 became editor of *The Quarterly Review.* His friendship with Sir Walter Scott resulted in one of the most notable biographies in the English language, the *Life of Scott.* Other works are *Adam Blair,* a novel, and lives of Napoleon and Burns. Lockhart died at ABBOTSFORD, Nov. 25, 1854.

LOCK HAVEN, a city near central Pennsylvania, the county seat of Clinton Co., situated on the west branch of the Susquehanna River, 25 mi. southwest of Williamsport; served by two railroads. The region is good farming country and rich in coal, fire-clay and shale. Great tracts of mountain and forest encompass the city. Paper manufacture is the important industry, Lock Haven also has furniture, wire, dye, silk and leather factories. The city was settled in 1833, beside the locks in the Pennsylvania canal; hence the name. It became a city in 1870. Lock Haven is the seat of a State Teachers College. Pop. 1920, 8,557; 1930, 9,668.

LOCKLAND, a city in Hamilton Co., southwestern Ohio, situated 12 mi. from Cincinnati, of which it is an industrial suburb; asbestos, cotton goods, paper and roofing are made. Lockland was founded in 1800. Pop. 1920, 4,007; 1930, 5,703.

LOCK-NUT, a device by which a nut is prevented from turning on its bolt. Lock-nuts are usually for the purpose of preventing the nut from working loose in service, but any device that prevents movement in either direction is a lock-nut. *See* BOLT.

LOCKOUT, a refusal on the part of the employer to allow his employees to work until they comply with certain demands, or until certain of their demands upon him have been withdrawn. He virtually locks out his employees until they agree to his terms. It is the employer's counter weapon to the STRIKE and like the strike it results in a stoppage of industry. Lockouts, like strikes, are in general lawful. In theory, individual lockouts, like strikes may be held unlawful because of unlawful purpose. In practice these limitations are less often applied to lockouts than to strikes. Lockouts are less frequent than strikes, but usually of longer duration. Employers have a more effective weapon in individual discharge. By discharging from time to time leaders who cause dissention, they accomplish the same purpose without wasteful stoppage of work.

The term lockout sometimes has a slightly different connotation. A strike virtually becomes a lockout when strikers finding it impossible or inadvisable to hold out longer for their demands decide to return to work, and the employer having found others to take their places refuses to take them back.

P. F. B.

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LOCKPORT, a city in northwestern New York, the county seat of Niagara Co., situated on the State Barge Canal, about 25 mi. northeast of Buffalo. It is served by interurban railways, buses, two railroads, and two private airports. Lockport was named for the canal locks which are situated in the center of the city. Niagara Falls furnishes power for the city's numerous industries. The manufactures include automobile parts, steel, saws, paper, towels, cotton batting, wall board, bottles, radiators, brooms, leather specialties, gum and felts. In 1929 the retail trade amounted to $13,280,610 and the total factory output was valued at $38,769,485. The city is in a noted fruit- and grain-raising section. Near by are limestone quarries. One of the country's widest bridges crosses the canal at Lockport. Settled sparsely between 1792, when the Holland Company owned the site, and 1820, after Esek Brown, a tavernkeeper, and others had bought it, Lockport was incorporated as a village in 1829 and became a city in 1865. Pop. 1920, 21,308; 1930, 23,160.

LOCKS, in hydraulic engineering, chambers having gates at either end, in which water is raised or lowered to pass a vessel from a lower to a higher level, or vice versa. Lock chambers are commonly constructed of concrete or stone masonry, though occasionally of steel and, particularly in the past, of timber. The most common form consists of a pair of "mitering" gates hinged at the chamber walls, although several other forms are used. Modern locks also are equipped with water gates and culverts for filling and emptying the chambers, guards for the gates, emergency gates to aid in making repairs, towing apparatus and machinery for control and operation.

In special cases hydraulic lifts, or counterbalanced tanks, carry vessels from one level to the other, and the inclined plane—similar to a marine railway and usually for small boats only—is substituted for locks. *See* DAMS; DRY DOCKS.

F. R. H.

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LOCKWOOD, BELVA ANN BENNETT (1830-1917), American lawyer and suffragette, was born at Royalton, N.Y., on Oct. 24, 1830, and graduated in 1857 at Genesee College at Lima, N.Y. After teaching school 11 years, she began to study law. She was admitted to the District of Columbia bar in 1873, and in 1879 received permission to practice before the Supreme Court, under a law which she had urged Congress to enact. She was active in women suffrage, peace and temperance movements,

and was nominated in 1884 and 1888 for President of the United States by the Equal Rights party. In 1896 she represented the United States in the Congress of Charities and Corrections at Geneva, Switzerland, and attended the International Peace Conferences in 1908 at London and in 1911 at Rome. She died at Washington on May 19, 1917.

LOCKYER, SIR JOSEPH NORMAN (1836-1920), English astronomer, was born at Rugby, May 17, 1836. He studied on the Continent and returned to England in 1857, continuing his astronomical work privately until 1870, when he became secretary of the Duke of Devonshire's royal commission on science. In 1875 he was attached to the South Kensington Museum. In the years 1870-1905 he headed eight eclipse expeditions and greatly improved the application of the spectroscope to the study of sun spots and solar prominences. He defined and named the chromosphere and, in 1868, independently of P. J. Janssen who made the same discovery, he solved the problem of making spectroscopic analysis of solar prominences at other times than during total eclipses. He died at Sidmouth, Aug. 16, 1920.

LOCOFOCOS, members of the Equal Rights faction (*see* EQUAL RIGHTS PARTY) of the Democratic party in New York State, 1835-37. Opponents of the system in New York of granting bank charters by special legislation for each case, which had resulted in chicanery and bribery, in 1835 established an organization which should support only candidates declaring their opposition to special bank legislation. A mass meeting at Tammany Hall, Oct. 29, 1835, was stormed by regular Democrats who failed to break up the meeting but turned off the gas. The Equal Rights men produced candles and locofoco (friction) matches and continued the meeting. The New York *Courier and Enquirer* derisively dubbed the faction Locofocos, and the name was afterward used by the Whigs to designate the Democratic party generally.

LOCOMOTIVE, a special power-driven carriage for drawing a train of railroad cars. Originally, a horizontal fire-tube BOILER mounted upon a frame work carried by wheels, some or all of which are driven, through linkages, by a STEAM ENGINE mounted beside the boiler. Of late, other arrangements of the essential parts have been tried out, and other sources of power have been used. A locomotive driven by a steam turbine (*see* TURBINE, STEAM) has been built in Germany, though this type has not been generally adopted. Other types are driven by electric motors (*see* MOTORS, ELECTRIC), by an INTERNAL COMBUSTION ENGINE, Diesel or OIL ENGINES—either directly connected to the driving wheels, or driving an ELECTRIC GENERATOR which in turn furnishes power for motors connected with the drive wheels—by COMPRESSED AIR, or by a motor driven AIR PROPELLOR. *See also* ELECTRIC LOCOMOTIVE.

When the conventional steam engine is employed, the cylinders are, in most cases, mounted outside the frame carrying the boiler, being incorporated in a casting known as the *saddle.* Steam from the boiler is collected in a steam dome at the top of the boiler and flows under boiler pressure through a connecting pipe to the cylinders. A hand actuated control valve, or *throttle,* is placed somewhere in the length of this connecting pipe—generally in the cab which protects the engine-driver. The fuel is fed to the furnace from the rear end of the boiler shell, and the gasses of COMBUSTION, after flowing through the boiler tubes, pass to the atmosphere through a short stack at the front end of the boiler, where suitable baffles or screens serve to eliminate cinders and sparks. The stack not being of sufficient length to provide the necessary DRAFT, the exhaust from the cylinders is permitted to escape through a nozzle immediately at the base of the stack, inducing a flow of air through the grate.

In America most locomotives are of the single expansion type, in which live steam from the boiler enters each of the two cylinders and after expansion, passes out the exhaust. *See* EXPANSION ENGINE. In European countries the compound expansion locomotive is in favor. In that type the steam, after partially expanding in one cylinder, passes into the cylinder on the opposite side of the locomotive where expansion is continued. A somewhat better efficiency is obtained by compound expansion, but the locomotive is not as flexible in starting. In some locomotives, four cylinders are employed, two being placed inside the frame and two outside. Those inside are high-pressure, expansion cylinders and take the steam directly from the boiler. The two outside cylinders take their steam from the inner two.

Modern railroad requirements have led to the design of huge locomotives, they being so long that the boiler has a flexible joint in it to permit the locomotive to round sharp curves. L. H. Mo.

LOCOMOTIVE, ELECTRIC. *See* ELECTRIC LOCOMOTIVE.

LOCOMOTOR ATAXIA, or **TABES DORSALIS,** a disease of the spinal cord. The name was known to the ancients, but the symptoms and causes of the disease were not known or accurately described until the last quarter of the nineteenth century. The disease is due to syphilis. The posterior columns of the spinal cord degenerate as a result of the action of the syphilitis virus. Tabes may occur forty years after the onset of syphilis, but generally begins eight or ten years after the initial lesion.

The posterior columns of the spinal cord consist mainly of sensory fibers. These nerve fibers carry the impulses of touch, pain, temperature and muscle sense. Because of this, the early symptoms of this disease are shooting or lancinating pains in the legs which are often interpreted as rheumatism. Gradually these pains may increase, until they sometimes result in crises, a condition of excruciating pain which is usually localized in the stomach or intestines. These pains are of such severity that they often prostrate the patient. These initial symptoms of pain are followed by "ataxic states." The patient loses the feeling in his legs and as a result does not know where he places his legs while walking. He walks throwing

his feet outward, and has the sensation of continuously standing on a soft carpet. Later he cannot walk unless he watches his feet constantly, and is, therefore, unable to move about at night. Gradually other symptoms appear, such as complete loss of locomotion, difficulties in the control of urine and feces, and finally the patient becomes bedridden. This progressive tendency of the disease may be slow. The disease is chronic and often lasts many years. (*See also* BLADDER, URINARY.)

Medically the disease is characterized by positive tests for syphilis in the spinal fluid and blood, and by many symptoms of loss of sensation.

The treatment of this disease depends on the treatment of syphilis. Damage once done the nerve tissues cannot be repaired, but the progress of the disease can often be arrested. C. A. N.

LOCO WEED, the name given to several poisonous plants of the pea family which cause the loco disease destructive to livestock in the western United States. The investigations of the U.S. Department of Agriculture have shown that six distinct kinds of loco plants are chiefly responsible for the disease. Of these the most important are the white loco weed (*Oxytropis Lambertii*)' the purple loco weed (*Astragalus mollissimus*), and the blue loco weed (*A. diphysus*).



LOCO WEED (*Astragalus mollissimus*)

The purple loco weed is poisonous to horses; the blue loco weed affects horses chiefly, but also cattle and sheep; the white loco weed is responsible for severe losses of all three classes of animals. In addition to the true loco weeds three closely allied leguminous plants have been found to be poisonous, but they do not produce the true loco disease. These deleterious plants are the timber loco (*A. Palliseri*), the four-wing poison vetch (*A. tetrapterus*) and the straight-stem poison vetch (*A. sabulosus*). All the foregoing poisonous plants are found in the Rocky Mountain region or in the adjacent plains. In many districts it has been found that loco weeds may be destroyed by digging without excessive cost.

LOCUS, a Latin word meaning place. In geometry it is usually applied to a line or a surface. In general, if a point moves in space subject to a given law, the figure generated consisting of all the points with which the moving point may coincide, and of no others, the figure is called the locus of the point. For example, the locus (Fig. 1) of the point *P*, in a plane, at the distance *r* from the fixed point *O*, is the circle *c*. The locus (Fig. 2) of points, in the plane, equidistant from the lines *a* and *b*, is the pair of lines *m* and *n*, each bisecting one of the adjacent angles at *O*. The locus in space corresponding to Fig. 1 is a sphere. In Fig. 2, we may replace the lines by planes perpendicular to the plane of this page, the locus then being a pair of planes. In the study of surfaces, a surface is generally defined as a locus, and the conic sections of the Greeks are now similarly defined. *See* SURFACE; CONICS; ANALYTIC GEOMETRY.

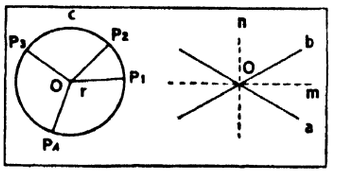
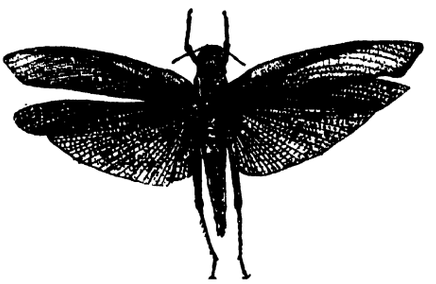


FIG. 1 FIG. 2

LOCUST, a term properly applied only to short-horned grasshoppers of the family *Locustidæ*. Unfortunately it has been applied also to longhorned grasshoppers (family *Tettigoniidæ*), as well as to cicadas. The latter belong to the order *Homoptera*,

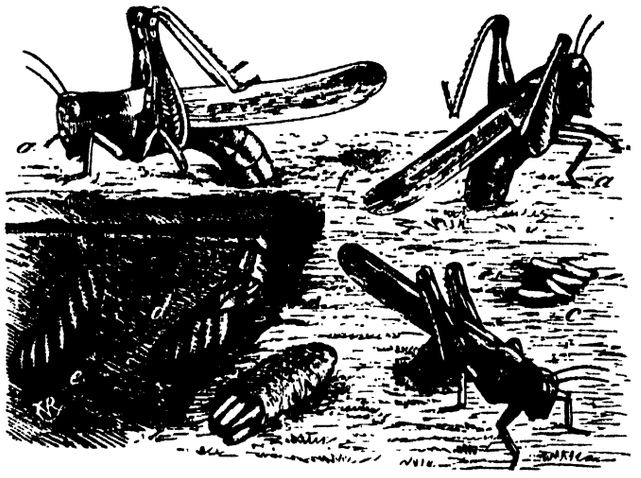


LOCUST, OR SUNSET GRASSHOPPER

and do not resemble true locusts. However, they are still popularly known by that name, two species being called the dog-day locust and the seventeen-year locust respectively. True locusts lay their eggs in the ground. Females are equipped with ovipositors for digging holes. Both nymphs and adults have chewing mouthparts, and feed on vegetation. If numerous, they may do much damage.

LOCUST, ROCKY MOUNTAIN, an American grasshopper (*Melanoplus spretus*) of the family *Acrididæ* (or *Locustidæ*), the only truly migratory species in North America. It is native to the eastern portion of the Rocky Mountain highlands, whence formerly great swarms of these insects migrated eastward when food became scarce. Large areas of the country west of the Mississippi River were often devastated by them. Such swarms consumed all green vegetation in their path. In 1931 such an invasion of

grasshoppers occurred. In the moist lowlands, nymphs of the second generation usually die before reaching maturity. The eggs are laid in the ground in the fall; the nymphs hatch the following season,



ROCKY MOUNTAIN LOCUST EGG-LAYING IN SURFACE OF SOIL

maturing after mid-summer. Late fall plowing destroys the eggs. Poisoned baits effectively control the nymphs. J. R. T.

LOCUST TREE (*Robinia Pseudo-Acacia*), a large handsome tree of the pea family formerly highly valued for hardwood timber and ornamental planting, called also false acacia and black locust. It is native from southern Pennsylvania to the Ozark region of Missouri, southward to Georgia and Oklahoma; it is also widely but sparingly naturalized in other parts of the United States east of the Rocky Mountains. The trunk grows 70 to 80 ft. high with small branches forming a narrow head and bearing long leaves of many leaflets, numerous showy clusters of fragrant pealike flowers opening in early summer, and reddish-brown seed pods ripening in autumn.

LODE, an ore deposit of tabular shape and usually steeply inclined. It may refer to a VEIN, or to a zone of rock distinguished from the surrounding material only by containing metalliferous minerals, or to a sedimentary bed partly replaced by ore, or to deposits filling a system of thin, closely spaced, interweaving fissures. *See also* ORE DEPOSITS.

LODESTONE, a form of MAGNETITE occasionally found in nature in a magnetized state. Lodestone was known to the Greeks about the 7th century B.C., but its directive property, utilized in the compass, was not discovered until seventeen centuries later. The Chinese probably used it before that, possibly ten centuries B.C. Powerful native magnets come from Siberia and Germany, and from Magnet Cove, Ark. *See also* MAGNETISM.

LODGE, HENRY CABOT (1850-1924), American statesman, publicist, and historian, was born at Boston, Mass., May 12, 1850, the member of a patrician family. Graduating from Harvard in 1871 he edited the *North American Review* from 1873 to 1876 while attending the Harvard Law School. Admitted to the bar in the latter year, he continued post-graduate work in history at Harvard until in 1879 he became editor of the *International Review.* In 1880 he left this post to become a Republican representative in the General Court of Massachusetts, and continued in active politics for the rest of his life. From 1887 to 1893 he was representative in Congress, and from 1893 until his death he sat for Massachusetts in the United States Senate. At the Republican conventions of 1900, 1908 and 1920 he acted as permanent chairman; in 1903 he was the American member of the Alaska Boundary Commission, and in 1907 he sat upon the Immigration Commission.

In addition to his politics Lodge continued his scholarly work, publishing widely upon historical subjects, chiefly American, and writing the biographies of Hamilton, Webster and Washington for the *American Statesmen* series.

But Lodge took into his politics little of his scholarly outlook, except a certain personal coolness. While a man capable of great charm, he had few close friends either in Washington or in the powerful political machine which he built in Massachusetts. In politics he was convinced of the unquestionable correctness of his own viewpoints and was intemperate, sometimes to the point of being dangerous, as in his speech in the Senate hastily demanding war with England in the Venezuelan boundary difficulty under Cleveland. Although he was a personal and political friend of Theodore Roosevelt, Lodge did not belong to the progressive faction within the Republican ranks, nor did he follow Roosevelt into the Progressive Party in 1912. As Chairman of the Committee on Foreign Relations and Republican floor leader of the Senate after 1918, he was the spokesman of the group determined to defeat the Treaty of Versailles unless President Wilson would accept drastic amendments to the Covenant of the League of Nations with it. His opposition was not so much to the treaty and its possible consequences as to the entry of the United States into the League of Nations. He continued the same policy a few years later in his opposition to President Harding's proposal to join the World Court. Lodge advocated a stringent limitation of immigration and after the sinking of the Lusitania in 1915 demanded that the United States enter the war against Germany. In brief he championed a policy of ardent, honest, but not always far-sighted nationalism. He was a delegate to the Conference on Limitation of Armament at Washington in 1921 (*see* WASHINGTON CONFERENCE) which concluded the agreement upon capital ships with Great Britain and Japan. He was for many years a member of the American Academy of Arts and Letters. He died at Nahant, Mass., Nov. 9, 1924.

LODGE, SIR OLIVER (1851-), English physicist and psychical research leader, was born at Penkhull, Staffordshire, June 12, 1851. He was educated at the University of London and in 1881-1900 was professor of physics at University College, Liverpool.

He was principal at Birmingham University from 1900 to 1920. In 1902 he was knighted and became a fellow of the Royal Society. From 1901 to 1904 he was president of the Society for Psychical Research. Beginning in 1910 he devoted most of his energy to the propagation of spiritualism. *Raymond, or Life and Death,* 1916, in which he recounts communications with his son killed in the World War, is one of his best known works on the subject. Other such writings include *The Survival of Man,* 1909, *Reason and Belief,* 1911, *Christopher, A Study of Human Personality,* 1918, and *The Making of Man,* 1924. He is also the author of several popular works on physics, such as *Ether and Reality,* 1925, *Relativity,* 1925, and *Talks About Wireless,* 1925. In 1919 he was the recipient of the Albert Medal of the Royal Society for his researches in wireless telegraphy.

LODGE, THOMAS (c. 1558-1625), English writer, was born probably at West Ham, Essex, about 1558. His father was Lord Mayor of London. The young Lodge graduated from Oxford in 1577, studied law and medicine, and traveled to the Canaries and South America. While on his travels he wrote the charming pastoral, *Rosalynde,* the basis of Shakespeare's *As You Like It.* Among Lodge's principal works are *A Defense of Poetry, Music and Stage Plays; a Looking Glasse for London and England,* a play written with Robert Greene; *Phillis,* a volume of charming poems; and *Glaucus and Scilla.* As a prose writer he used an elaborate style borrowed mainly from JOHN LYLY and known as euphuism, but as the author of *Rosalynde* he ranks high among pastoral writers. Lodge died in London, papers of administration being granted his widow, Oct. 12, 1625.

LODI, a city in San Joaquin Co., central California, 35 mi. southeast of Sacramento, served by three railroads. There is an airport five mi. north. Fruit-growing, especially grapes, and dairying are the leading interests of the vicinity. Pumps, tire-moulding machinery and grape juice are the principal manufactures. About 45 mi. southwest of Lodi is Mt. Diablo State Park, a refuge for game. Lodi was founded in 1869 and incorporated in 1906. Pop. 1920, 4,850; 1930, 6,788.

LODI, a manufacturing borough of Bergen Co., N.J., located on the Saddle River, 9 mi. north of Jersey City. It is served by the New York, Susquehanna & Western Railroad, and by buses operating over several highways. Industries include the dyeing and bleaching of silks and cottons and the manufacturing of rubber goods, parchment paper and plantation car equipments. The retail business in 1929 amounted to $1,800,097. Pop. 1920, 8,175; 1930, 11,549.

LODZ, the most important manufacturing city of Poland and second largest in population, situated 82 mi. southwest of Warsaw. Area 11 sq. mi.

At the end of the 18th century Lodz was an unimportant town in the district of Lenczyca. To-day it is an important railway junction and one of the largest centers of textile manufacturing in Europe. A remarkable development in the cotton, woolen and silk industry took place in the second half of the 19th century due to an influx of German capital and industrialists. Next in importance is the manufacture of chemicals, machinery and beer. The output of the Lodz factories in 1930 was over $75,000,000. Although the city has a number of educational institutions and is the seat of the voievodship, it has no outstanding public structures. Until the World War, under Russian domination, the city with a half million population had no sewer system and no water works; these public works were started and completed in the post-war period after the city reverted to independent Poland. The city possesses several parks of which the Poniatowski and Helenow are the largest. Public welfare organizations in Lodz, both Polish and Jewish, include hospital facilities, day-nurseries, kindergartens and community houses. Est. pop. 1930, 606,980.

LOEB, JACQUES (1859-1924), American physiologist and biochemist, was born at Mayen, Germany, Apr. 7, 1859. He was educated at Berlin, Munich, and Strasbourg and came to the United States as professor at Bryn Mawr in 1891. In 1892 he became professor at Chicago, in 1902 professor at Berkeley, and in 1910 Director of the Department of Experimental Biology at the Rockefeller Institute, New York. He worked with great success upon heterogeneous hybridization, regeneration, artificial parthenogenesis and kindred bio-chemical problems. Loeb wrote *Proteins and the Theory of Colloidal Behavior,* 1922, *Regeneration from the Physico-Chemical Viewpoint,* 1924. He died at Hamilton, Bermuda, Feb. 11, 1924.

LOEB, JAMES (1867-), American Hellenist and banker, was born at New York City, Aug. 6, 1867. He entered the banking firm of Kuhn, Loeb & Co., New York, but resigned from active membership, 1901, to pursue studies in Greek and Roman literatures. In 1905 Loeb endowed the Institute of Musical Art of New York City, and founded the Munich Deutsche Forschungsanstalt für Psychiatrie, devoted to research in mental disease. He founded the Loeb Classical Library, which is to cover twenty-five centuries of Greek and Latin literatures, the original texts with facing translation; a number of the volumes have appeared at intervals since 1912. He has published translations of Paul Delcharme's *Euripides and the Spirit of his Dreams* and Maurice Croiset's *Aristophanes and the Political Parties at Athens.*

LOEFFLER, CHARLES MARTIN (1861-), American-Alsatian violinist and composer, was born at Mülhausen, Jan. 30, 1861. He studied the violin under Massart at Paris and JOSEPH JOACHIM in Berlin. In 1881 he visited the United States, becoming a violinist in the Boston Symphony Orchestra. His compositions belong to the modern descriptive school, and include *Les Veillées de l'Ukraine,* for orchestra and violin, *Fantistic Concerto,* for orchestra and violoncello, a chorus for 8 parts, *For One Who Fell in Battle,* and symphonic works, among them *The Canticle of the Sun,* performed in 1925.

LOEFFLER, FRIEDRICH (1852-1915), German physician, was born at Frankfort-on-Oder, June 24, 1852. Originally an army physician, in 1879 he became attached to the Imperial Health Commission. He was professor of medicine at Greifswald in 1888, member of the Imperial Health Commission in 1899, and in 1913 took charge of the Berlin Institute of Infectious Diseases. He isolated with Klebs the bacillus of diphtheria and discovered the bacteriological causes of several diseases of animals. He died at Berlin, Apr. 9, 1915.

LOESS, a peculiar, dustlike yellow soil of extreme fertility, occurring in immense deposits in the Mississippi Basin, the Rhine Valley and the Hwang-ho district of China. The name loess, meaning "loose," describes the unstratified, unconsolidated characters of the accumulation, which is, however, held together by casts of grassroots, forming perpendicular tubes through the mass. It has the property of vertical cleavage, standing up in steep cliffs, exemplified near Omaha, Nebraska.

The loess, covering thousands of square miles in the Mississippi Basin, is usually from 10 to 50 ft. thick. In China it buries hills and valleys under a dustplain, which in places reaches a depth of 1,000 to 2,000 ft.

Loess is now recognized as a windborne, or Aeolian deposit. The original source of the dust may be fine desert sand, dried mud of river flood-plains, or rock-flour from an ancient glacier, which the winds steadily transport out of arid, into humid regions.

LOFOTEN ISLANDS, a chain of islands on the northwest coast of Norway, stretching southwest and northeast for 150 mi. The wildness of their landscapes—the Lofotens reach an altitude of 4,155 ft.—is enhanced by the still greater wildness of the seas which beat upon them. The fjords on the south are subject to tempests of sudden and appalling violence, and the swiftness of the currents sometimes rises to whirlpool velocity, such as the Maelstrom. In spite of the perils of these waters, some 40,000 men gather here every year to fish for cod and herring.

LOG, in nautical measurements, a device consisting of a rotator, line and counter for measuring the speed of a vessel. The rotator is thrown overboard and its revolutions indicated in the counter, which is generally fastened at the stern of the vessel. The unit of measurement for nautical distances is the KNOT.

LOGAN, JOHN (c. 1725-80), American Indian chief, was born in Pennsylvania about 1725. He was widely known among the settlers as a loyal friend, and was prominent in the affairs of the Indians. The Mingoes chose him as chief and called him *Tah-gah-jute.* In 1770 he moved to the banks of the Ohio, where in 1774 his family was massacred by white people. Infuriated, he incited the Indians to war, and was himself conspicuous for his cruelty. He opposed peace, and sent to the Virginia governor, LORD DUNMORE, a message explaining his stand, now one of the famous examples of the eloquence of the Indian. This document's authenticity is not certain. After the war he became addicted to drink, and was killed in a quarrel in 1780.

LOGAN, JOHN ALEXANDER (1826-86), American soldier and political leader, was born in Jackson Co., Ill., Feb. 9, 1826. After serving in the Mexican War he studied law and practiced in Illinois. He was elected for two terms to the Illinois legislature, 1852-53 and 1856-57, being in the interval prosecuting attorney. He served in Congress as a Douglas Democrat in 1858-61, when he entered the Union army, as colonel of the 31st Illinois regiment. He participated in the capture of Forts Henry and Donelson, and was promoted to brigadier-general. As major-general he led his command at Vicksburg, Nov., 1862 to July, 1863, and was with Sherman during the march through Georgia (1864) and the Carolinas (1865). After the war he returned to Congress in 1867 and was prominent in the impeachment proceedings against President Andrew Johnson. In 1871 he was elected to the U.S. Senate and served several terms until his death. He was also candidate for Republican Presidential nominee in 1884, but upon the nomination of James G. Blaine, was nominated for Vice-President. During his public career he made several notable speeches on reconstruction and other subjects, and was greatly esteemed for his ability as a soldier and legislator. Died in Washington, Dec. 26, 1886.

LOGAN, a city in southern Ohio, the county seat of Hocking Co., situated on the Hocking River, 50 mi. southeast of Columbus. It is served by the Chesapeake and Ohio Railroad. This district produces chiefly grain and potatoes. Logan has furniture, shoe and other factories. There are several State parks near by. Logan was founded in 1816; incorporated in 1839. Pop. 1920, 5,493; 1930, 6,080.

LOGAN, a city in northern Utah, the county seat of Cache Co., situated 87 mi. north of Salt Lake City and served by bus lines and two railroads. There is an airport. Logan is the seat of the Agricultural College of Utah. The city has various food products factories. The countryside produces sugar beets, wheat, peas and dairy products. The Mormons came here in 1859; Logan was incorporated in 1866. Pop. 1920, 9,439; 1930, 9,979.

LOGAN, a city in southwestern West Virginia, the county seat of Logan Co. It is situated 70 mi. southwest of Charleston and 70 mi. south of Huntington. Timber-cutting and coal-mining are the chief industries of the vicinity. Logan is in the center of a coal field producing 18,000,000 tons annually. The Chesapeake and Ohio Railroad serves the community. Pop. 1920, 2,998; 1930, 4,396.

LOGAN, MOUNT, the highest peak in Canada, situated in the Yukon country near the Alaska border line. It is part of the Canadian coast range and in the center of a large glacial area. Its altitude is 19,850 ft., about 1,842 ft. higher than Mount St. Elias 26 mi. southwest, although the latter peak seems to be loftier. On the coast side its glaciers descend almost to sea level and on the interior to the timber

line at 3,500 ft. above sea level. It was first ascended in June 1925 by an expedition sponsored by the American and Canadian Alpine clubs led by A. H. MacCarthy.

LOGANBERRY (*Rubus loganobaccus*), a valuable bush fruit originated in cultivation and supposedly a hybrid of the wild blackberry (*R. ursinus*) of California and the cultivated red raspberry (*R. idæus*). It was developed in 1881 in the nurseries of J. H. Logan, of Santa Cruz, Cal. In the flavor of the fruit and in its manner of growth the loganberry exhibits the characteristics of both parent forms. The thimble-shaped berry, 1¼ in. long and purplish red when ripe, is one of the largest bramble fruits grown. It is cultivated from southern California to British Columbia, attaining commercial importance in western Oregon where its culture, especially for canning, has developed into a substantial industry. According to the census of 1930, the production for 1929 of loganberries in Oregon was 5,726,080 qts.; in Washington, 1,861,613 qts., and in California, 664,343 qts.

LOGANSPORT, a city in north central Indiana, the county seat of Cass Co., situated at the junction of the Wabash and the Eel rivers, about 70 mi. northwest of Indianapolis. It is served by the Pennsylvania and the Wabash railroads. Logansport is the trading center for a productive farming country, with natural resources of limestone, sand and gravel. It has growing industries. In 1929 the manufactures amounted approximately to $6,000,000; the retail trade was valued at $11,018,084. Located here is a State Asylum for the Insane. Fitch's Glen, in the vicinity, is of scenic interest. On land acquired by the Government from Indian tribes in 1826, Logansport was established in 1828, and incorporated in 1831. It was named for Capt. Logan, a friendly Shawnee chief. The city charter dates from 1838. Pop. 1920, 21,626; 1930, 18,508.

LOGARITHMIC DECREMENT. *See* ELECTRIC WAVES.

LOGARITHMS are a system of tabular numbers which enables one to shorten the computation in certain arithmetical operations. Multiplication is then performed by addition, division by subtraction, raising to powers by multiplication, finding of roots by division. The word logarithm, coined by Napier, means ratio number (Gr. *logos* + *arithmos*). Compare these two series, the first being arithmetic (the natural numbers in sequence), and the second being geometric, with the ratio 2:

0, 1, 2, 3, 4, 5, 6, 7, 8, 9 etc.,
1, 2, 4, 8, 16, 32, 64, 128, 256, 512, etc.

Each term in the arithmetic series is called the logarithm of the corresponding term in the geometric, and indicates the number of times the ratio 2 is used as a factor in the latter, the antilogarithm. Thus the 5 above 32 indicates that $32 = 2^5$; or, stated conventionally, $\log_2 32 = 5$. If now we wish to multiply 64 by 8, the numbers of the series tell us that $64 \times 8 = 2^6 \times 2^3 = 2^9 = 512$, the number just below 9; or, $\log 64 + \log 8 = \log 512$. Similarly $512 \div 32 = 2^9 \div 2^5 = 2^4 = 16$.

Before the above tables could have practical value we should have to supply the logarithms of the intervening numbers 33, 34, etc. by interpolation. We have used the ratio 2 for simplicity, but any number may be used. The base used in ordinary calculation is 10, as might be expected, resulting in the common, or Briggs logarithms; in higher mathematics the base frequently used is a transcendental number *e*, which is approximately 2.718, the natural, hyperbolic or Naperian logarithms. Since logarithms are exponents they obey the laws of exponents. Hence these formulas:

$$\log xy = \log x + \log y,$$
$$\log \frac{x}{y} = \log x - \log y,$$
$$\log x^m = m \log x.$$

Their elegant interpolation processes have made the adoption of the common logarithms universal for practical computation. Since $100 = 10^2$, $1000 = 10^3$, $10{,}000 = 10^4$, then $175 = 10^2 +$ a fraction, and $1750 = 10^3$ a fraction. The integral parts 2, 3, are seen by inspection. The tables therefore need contain only the fractional parts. Moreover, the same fraction (*mantissa*) obtains for 175, 1750, 1.75, etc., since $1750 = 10 \times 175$, $1.75 = 10^{-2} \times 175$, etc.

The first one to publish a scheme of logarithms was John Napier, who in his *Descriptio* (1614) gave tables of logarithms for the trigonometric functions. The first computers did not understand the connection between exponents and logarithms. Napier used an inconvenient base, arrived at kinematically. In 1615 Henry Briggs greatly improved Napier's invention by using the base 10 and calculating the logarithms of the natural numbers. Before his death he had carried the calculation to log 30,000. By 1628, the mantissas for all numbers up to 100,000 had been calculated. John Speidell, in his *New Logarithms* (1620), used *e* as the base. Other pioneer computers were Bürgi (1620) and Vlacq (1626).

In some fields, notably astronomy, there is great need of $\log_{10}(a + b)$ when $\log_{10} a$ and $\log_{10} b$ are known. In 1812, Gauss published a five-place table of such logarithms, since then called GAUSSIAN LOGARITHMS. M. No.

LOGGING. *See* LUMBER INDUSTRY.

LOGIC, broadly speaking, is concerned with the value of arguments or the validity of proof. An age such as this, which boasts of having dispensed with authority, lays on each individual the responsibility of estimating the worth of every appeal from press and platform, advertisement and salesman, novelist and dramatist. In science the overthrow of traditional concepts and the rapid succession of revolutionary theories has raised anew the problem of what constitutes proof. Even mathematics, the most rigid and precise field of discourse, must continually revise and reconsider its proofs. What is accepted as complete demonstration by one generation or by one mathema-

tician is rejected by a later generation or a rival mathematician. What is true of mathematics is true in greater degree of the less exact sciences. The social sciences, after vainly imitating the supposed methods of the physical sciences, have stopped to inquire what scientific method really consists in.

Field Covered. Such a characterization of the field of logic is, perhaps, too broad. In estimating the worth of arguments or in weighing evidence, a great deal depends on special knowledge of the field of discourse, and this knowledge belongs rather to the special science than to logic, the science of sciences. Yet logic cannot be wholly divorced from the subject matter with which it deals. What propositions mean and what they involve are as essential to the validity of the conclusion as the form in which they are related. And the scrutiny of premises, the search for concealed assumptions, and the reduction of arguments to their bare fighting strength, is surely an exercise in logic. In so far, however, as logic is an exact science which can be reduced to general principles, we may say that it is the science of the general principles of valid inference. But, like physics or mathematics or psychology, logic overlaps other fields and the term can legitimately cover any subject matter directly related to the problems of making our thinking effective and our discourse profitable. Various approaches would involve different treatments and would eventuate in different definitions.

The psychological approach, frequently condemned as not being the straight and narrow path that leads to pure logic, investigates the mechanisms of fruitful, as opposed to useless and abnormal, ways of thinking. John Dewey's *Essays in Experimental Logic* and *How We Think*, Rignano's *Psychology of Reasoning* and Graham Wallas's *Art of Thought* are recent examples of this approach. Descartes's *Discourse on Method*, the *Port-Royal Logic*, based on Descartes, Spinoza's *Treatise on the Improvement of the Understanding*, Locke's *Essay Concerning Human Understanding* and Hume's *Treatise of Human Nature* are earlier examples of this approach. They are concerned with the processes and methods of correct thinking, and whether or not they are logic they constitute a most valuable part of a student's training in effective thinking. A logic which is too exclusive to recognize this type of treatise is not likely to be the gainer.

Inadequate Language. The language approach to logic has been somewhat neglected. It is too little realized that in spite of the illogical nature of grammar language is the vehicle of thought. Not only is there the need for a logical analysis of language and composition, but there is also the task of making existing language as precise and accurate as possible for the purposes of exposition and demonstration. Bishop Wilkin's *Essay towards a Real Character and a Philosophical Language*, 1668, is an interesting, but almost forgotten, attempt to construct a universal logical language. Leibniz also toyed with the project. Whatever may be the faults of existing languages from the point of view of logic, it remains a fact that nearly all discourse and proof must be carried on by means of them. Hence, the usual elementary texts which take their starting point and their material from the language of everyday use are sounder pedagogically and of more utility than those which attempt a purely symbolic introduction.

The logic of the sciences involves an investigation of the general features of methodology, the formal principles underlying inductive inference, and the most general categories of the sciences. Bacon's much criticized *Novum Organum*, 1620, undoubtedly laid the foundations of the study of the logic of discovery. A little remote from the science of his own day, still adhering to the scholastic concepts, he nevertheless caught the spirit of the age of science, gave the keenest criticism of the scholastic and humanistic thought, and called attention to the experimental and inductive method. A more empirical and descriptive study of actual scientific practice and a more thorough analysis of the methods of induction were made by William Whewell (1794-1866) and John Stuart Mill (1806-73). Although the latter's methods of induction can hardly stand the test of rigid formal analysis, they may still be regarded as rough tests of the probable truth of an hypothesis or as methods of elimination.

Besides being concerned with the processes and technique of hypothesis and verification, a logic of the sciences is necessarily concerned with the more general of the concepts of science. Here logic borders on METAPHYSICS. But not only must it examine its own categories, such as inference and implication, but it cannot avoid the critical discussion of the meaning and limitation of such categories as causality, continuity, necessity, probability, mechanism and habit.

Aristotle and Plato. Finally, formal and symbolic logic, which many regard as the only true logic, aims at removing all special subject matter from consideration and concerning itself with the form alone. Aristotle no doubt laid the foundations of formal logic by his analysis of the proposition into subject-copula-predicate, and by his systematic treatment of the syllogism which he claims to have discovered. The writings of his predecessors, however, contain a vast amount of material belonging to the broader aspects of logic. Rhetoric and mathematics were already advanced subjects well aware of their methods. Plato's dialogues abound in discussions of the principles of definition, division, the proof of hypothesis, the method of analogy, fallacies, etc. Aristotle's claim to the discovery and systematic investigation of the syllogism, is, however, probably correct.

Little was added to Aristotle's admirable treatise, in spite of the modest hopes which he expresses in the famous passage in the *Sophistici Elenchi*, by his immediate followers or by the subtle logicians of the Middle Ages. Perhaps little could be added on the basis of the substance-attribute metaphysics which prevailed. A more flexible, more generalized, and more precise treatment awaited three improvements: (1) a treatment of terms from the denotative, rather than from the connative, aspect; (2) a reinterpreta-

tion of the proposition which would include relations and functions; (3) a symbolism which would be more than a mere abbreviation of the Aristotelian logic. With these improvements, whose development is due to Leibniz, Boole, DeMorgan, C. S. Peirce, Peano, Frege, Russell, Whitehead, and others, the Aristotelian logic takes its place in a much more generalized scheme. The "immediate inferences," in so far as they are valid, are obvious consequences of the principle of permutation and one or two other axioms. The categorical syllogism, which in the traditional logic is treated at great length, may now be disposed of incidentally in a few simple theorems. The various figures and moods lose their importance, and the whole mechanism of the syllogism is shown to depend on the transitivity of the relation of class inclusion and a few other fundamental principles. The Ladd-Franklin theorem provides in a single formula the test for any of the Aristotelian moods and figures.

While the calculus of classes greatly extends and simplifies the traditional logic, the calculus of propositions, based on the relations of implication, disjunction, conjunction, etc., vastly extends the range covered by the traditional treatment of hypothetical and disjunctive syllogisms. A whole new field is opened up by the conception of propositional functions, and another by the calculus of relations. All these separate calculi are built up and integrated in a single system or logistic in Whitehead and Russell's epoch-making *Principia Mathematica.*

There is some dispute as to the value of logistic as an aid to creative thinking in mathematics and science. Poincare contends that it shackles, rather than assists, the mind in mathematical creation. However that may be, there is no question as to its value in analyzing the fundamental processes and laws of inference, in rendering the science of logic rigid, precise and accurate, and in reducing long and complicated processes to a compass that the eye can grasp at a glance.

E. T. M.

BIBLIOGRAPHY.—Aristotle's logical works are now available in excellent English translation in the Oxford Edition. Lewis, *Survey of Symbolic Logic,* 1918, is a good text for the beginner. Russell's projected *Principles of Mathematics* of which one volume appeared, and Whitehead's projected *Universal Algebra* of which one volume was published, gave place to the monumental *Principia Mathematica* whose four volumes appeared from 1910-1913. A revised edition was published in 1925. Russell's *Introduction to Mathematical Philosophy* is also an excellent introduction to the subject. For a more complete bibliography see the appendix to Lewis, *Survey of Symbolic Logic.* A short, but accurate, bibliography appears in Ralph M. Eaton, *General Logic,* 1931.

LOGISTICS, the branch of military art which embraces the details of moving and supplying troops in war. It includes the operations of the Quartermaster Corps, Ordnance Corps, Medical Department and Corps of Engineers. Logistical considerations form the basis for all tactical and strategical plans.

Fleet logistics, or the study of the logistic element of the fleet grand strategy basically involved in a definite campaign, embraces not only the study of the processes and sufficiency of production, storage, transport and distribution, from the standpoint of their dependency upon the country's internal facilities; but goes far afield into and to the root of the country's external policies.

In waging war, the support of all activities is mutually and fundamentally dependent upon production; production both at home and amongst those countries abroad who are friendly. The logistics of production, being of mutual importance to all war activities, was, during the World War, handled by an independent central agency in each country. England had its Ministry of Munitions; in the United States was the War Munitions Board.

LOGOS, the principle of reason governing the world; the connecting link between God and the world. The first conception is STOIC, the second derives from NEO-PLATONISM.

The Stoic metaphysics is pantheistic and holds that running throughout nature there is the principle of reason. This reason is not only a part of nature but determines its development. Reason is embodied in nature and nature is essentially rational. This governing principle in nature is what the Stoic means by Logos.

In Neo-Platonism there is a great gap between the supersensible world on the one hand and the world of sensible things on the other. Yet these two worlds must be bridged in some way. The Logos is the connecting link that bridges the gap between the spiritual and the material worlds. Theologically, this problem takes the form of the relationship between God and the world. In Christian theology Christ becomes the Logos between God and man, and this doctrine is developed into a Christology.

LOGOTHETE, a high officer of the Byzantine Empire, representing the Emperor, in charge of various divisions of public administration. The term was also used for the chancellor, and was employed in the Western Empire.

LOG WASHER, a machine used in ORE TREATMENT, comprising a slightly slanting trough in which revolves a shaft with oblique blades. Ore is fed into the lower end, and water at the upper. The revolving blades carry the heavier ore to the upper end, while any clay present being lighter, is washed out at the lower end.

LOGWOOD (*Hæmatoxylon campechianum*), a leguminous tree valued for its heavy heart wood used in dyeing. It is native to Central America and cultivated in the West Indies. The tree grows to a maximum height of 40 ft. but the wood may be utilized when the tree has attained an age of about 10 years. After removal of the bark and sapwood the dense, brownish-red heart wood is marketed in blocks and billets. The coloring principle, haematoxylin, is obtained from the wood by fermentation. Besides its use as a dyestuff, logwood is employed in microscopy as a staining agent.

LOHENGRIN, an opera in three acts, music and libretto by RICHARD WAGNER; première, Weimar, 1850, New York, 1871, London, 1875. Wagner encoun-

tered difficulty in securing a presentation of this work, his fourth opera. More than three years elapsed between the completion of the score and its production, and the composer waited 14 years before hearing it himself in Vienna.

In order to quell a Hungarian invasion of Germany, King Henry I of Germany goes to Antwerp to raise an army. He finds the country in a turmoil. Gottfried, son of the Duke of Brabant, has disappeared. Elsa, his sister, is charged with murdering him in order to succeed to the sovereignty. Count Frederick of Telramund, impelled by his wife Ortrude, lodges a charge of murder against Elsa, at the same time presenting his own claim as heir to the duchy. Unable to find a champion to defend her innocence in a trial by arms, Elsa asks the king to sound the trumpets: a knight whom she has seen in a vision will come at the call to defend her. The trumpets sound, whereupon a swan approaches along the river Scheldt, bearing a knight clad in silver armor. Alighting, he announces that he has been sent by God to defend an innocent maiden. Elsa recognizes him as the knight who appeared in her vision. He offers to defend her, asking only two things: she is to become his wife and never ask him his name or lineage. Elsa assents, and the knight defeats Frederick of Telramund in combat. He and his wife Ortrude are sentenced to exile, but instead of leaving the country they plot against Elsa and her mysterious champion, who shortly are united in marriage. Eventually Elsa is torn by curiosity, and breaks her compact with her husband, asking his identity. Proclaiming that he is none other than Lohengrin, son of Parsifal, Knight of the Holy Grail, he says that now he must leave her. The swan reappears, ready to bear him away; but Ortrude intervenes, declaring that she had bewitched Gottfried, turning him into a swan. Setting aside Ortrude's deed, Lohengrin transforms the swan into Elsa's brother, a dove descends to guide the boat in which Lohengrin has taken his place, and Elsa, overcome, dies in the arms of her long-lost brother.

LOIRE, the longest river in France. It rises in the central plateau at an altitude of 4,500 ft., flows north and west to the Atlantic Ocean at ST. NAZAIRE. The river flows through the towns of Orleans, Blois, Tours, Saumur, and near Angers where it is joined by its most important affluent the Maine. The Cher, Indre and Vienne are tributaries meeting near Tours. The Loire is navigable for 130 mi., a shorter extent than that of any of the other important rivers of France. Broad and sandy, it becomes a narrow stream in dry midsummer and frequently is dangerously flooded in rainy seasons.

LOKMAN, the reputed author of a collection of Arabic fables; also the name of the 31st sura of the Koran. The fables closely resemble those of Aesop and Syntipas and many are of Greek and Indian origin. Lokman is variously represented as an ugly Nubian slave, a nephew of Job or Abraham, a councillor of David or Solomon, a tailor, a shepherd, a carpenter, and as Balaam. The fables were first collected and put into their present form by Barsunia, an Egyptian Christian, late in the 13th century.

LOLLARDS, THE, constituted a group of English heretics appearing early in the 14th century and surviving in part until the movement merged into THE REFORMATION. Doctrines similar to those of the Lollards were preached upon the Continent, particularly by the Waldensians, but the name Lollard is confined to the followers of the English priest JOHN WYCLIFFE. Wycliffe's movement, led by a substantial section of the lower clergy, began as an attack upon certain features of the political organization of the Church: the wealth of the monasteries and higher clergy, the power of aliens in the English Church, the extensive jurisdiction of the ecclesiastical courts, and the resulting political and worldly outlook of the Church. Equally in civil life they opposed war and wealth as unchristian. But inevitably the Lollards were gradually driven to reject certain theological points which they deemed the source of the Church's preoccupation with worldly things: tithes, monasticism, confession, masses for the dead and absolution. Similarly they were forced to advance doctrines which they believed would lead the Church in the desired direction: the supremacy of the civil power, the right of everyone to obtain the Bible in his own language, and the right of the state to seize Church property.

During the 14th century the Lollards were extremely well intrenched in England, commanding the support of the lower clergy, the towns and the smaller gentry, and thus having a power in the Commons sufficient to block drastic repression, but after 1400 the movement declined rapidly. With the improvement in economic conditions from the misery of the 14th century and the temporary success in the war with France, teachings of poverty and pacifism became less appealing than formerly, and with the increase of Church power after the closing of the GREAT SCHISM in 1415 the Lollards were driven to cover. Yet as an underground movement, propagated in secret, the Lollards continued and gave to the Lutheran Reformation deep roots in English life, a fact which in no small measure accounts for the relative ease and suddenness of the English Reformation.

LOMBARD, the extinct GERMANIC language of the Langobardians or Lombards, a Teutonic tribe who lived on the bank of the lower Elbe, whence the majority of them emigrated to the Danube countries about 400, subsequently establishing themselves as rulers of Italy, 568-774. The second, or High German, consonant-shift (*see* GRIMM'S LAW) appears to have started in this Germanic dialect south of the Alps.

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LOMBARD, a city in DuPage Co., in northeastern Illinois, 22 mi. northwest of Chicago. It is served by three railroads. The local industries are the manufacture of tiles and bricks. The city has large green-

houses and a municipal park, Lilacia, with a notable collection of lilacs. Lombard was incorporated as a town in 1869. Pop. 1920, 1,331; 1930, 6,197.

LOMBARD LEAGUE, a union of Lombard cities formed to defend their traditional liberties against the aggressions of the Emperor Frederick Barbarossa of Germany. The original Veronese league was formed of Verona, Vicenza, Padua, Treviso and Venice in 1162. In 1167 another league was formed for the same purpose between Cremona, Bergamo, Brescia, and other cities in Lombardy. The union of these two minor leagues in the Lombard League took place in Dec. 1167, and was still further strengthened by the addition of other cities in the following years. In 1176 the league was able to defeat the Emperor at Legnano and exacted important concessions from him at the Peace of Constance, 1183. Nevertheless powerful as they proved to be thus united, the league made no attempt at a permanent organization and had no aspirations to unite as a nation. In 1226 a second Lombard League was formed to oppose Frederick II.

LOMBARDS, a Germanic tribe, which by the 6th century had moved from its home east of the Elbe into Pannonia. Numbers of them served in the armies of Justinian during the Gothic wars. In 568, under their king, Alboin, the whole tribe invaded Italy, founding a kingdom in the north as well as scattered duchies elsewhere in the peninsula. An extensive code of laws was issued by their king, Rothari, in 643. Having adopted the Arian form of Christianity the Lombards proved a constant menace to the papacy. This menace continued after their conversion to orthodox Christianity, inasmuch as their kings were intent upon the territorial unification of the Italian peninsula and thus endangered the prestige and political power of the popes. At the request of Pope Stephen, Pepin III, King of the Franks, attacked and defeated the Lombards. His son Charlemagne absorbed their kingdom in 774.

LOMBARD SCHOOL OF PAINTING, the group of schools closely related in style and development in the Lombard cities of northern Italy during the 15th and 16th centuries. In general this composite school is characterized by a graceful tenderness of feeling, and by rare delicacy and purity of coloring. Practically all its many noted artists wandered away from their native towns to the brilliant schools of Venice and Florence to learn the secrets of the mellow blending and lustrous, glowing coloring of the former, and the scientific basis of perspective and modeling of the latter. But they returned to combine their ideas, and to give form and color an ethereal loveliness. The greater part of the work of this school was of a religious and devotional nature, portraying serene mastery rather than the violence of passion. Each artist as his work matured sounded his own clear note of spiritual and idealized beauty: Borgognone, a sincere piety; Luini, an exquisite charm and sweetness; Correggio, the lyrical joyousness of his sensuous religion. That art is the inevitable expression of political, social and religious aspects of a period or country is shown by the Lombard schools. These may be loosely divided into two groups under the strong patronage of the two most powerful and beneficent Lombard despots, whose respective courts were presided over by those most interesting of Renaissance women, the sisters of the house of Este. The western Lombard towns looked to Milan as their center. Here the power and wealth of Lodovico Sforza and the beauty and charm of his wife, Beatrice d'Este, attracted and encouraged art in all its branches. Here Leonardo da Vinci was called from Florence about 1485, to institute an academy of art. The celebrated art treatise *Trattaguages* and other literary works were prepared for the academy by Leonardo and are as practical for art students to-day as they were then. While this remarkable school of Leonardo became the center of Lombard art, prior to his arrival a Milanese school had been founded by Vincenzo Foppa, whose best known pupil, Borgognone, was later to come under the influence of Leonardo. As architect as well as painter, Borgognone designed and adorned the splendid Certosa at Pavia. Other celebrated artists identified with the Milanese School are Zenale, Luini, Ferrari, Bramante, and his pupil Bramantino, Butione, Previtali, the famous Piazzi family, Solario and Sodoma. Outranked in power and possessions, the fraternal jealousy of Francesco Gonzaga and his wife, Isabella d'Este, incited them to make the little court at Mantua preeminent in cultured magnificence. Though lacking the beauty of her sister Beatrice, Isabella through the force of her intelligence and sagacity gained an ascendency over the most learned men and leading artists of the early Renaissance. Giulio Romano, favorite pupil of Raphael, as architect and painter rebuilt and decorated the Palazzo del Tè and the cathedral at Mantua, and executed a number of large frescoes in the Castello. Mantegna, at the age of 30 and at the height of his fame, was persuaded to enter the service of the Gonzagas in 1460; except for rare intervals, until his death in 1506, he was attached to the court. Correggio, in whom Lombard sweetnees and gentleness reached their culmination, was head of the School of Parma. He spent a number of years at Mantua, engaged chiefly in making easel pictures for the private suite of rooms of Isabella.

LOMBARD'S KOP, BATTLE OF. *See* South African War.

LOMBARD STYLE, in architecture, the style of Lombardy, in North Italy. If used without further qualification, the term usually refers to the Romanesque style of Lombardy. This, one of the most vivid and creative of the Romanesque styles, is characterized by the great development of buttress strips for exterior wall decoration, arcaded cornices, decoration based on both Byzantine and grotesque sources, general large scale, and especially by its invention of the ribbed groined vault, so important in the later development of Medieval architecture. The Lombard school of Romanesque design deeply affected all north Italian work as far east as Verona, much of the Romanesque

work of Germany, and through Lanfranc of Pavia, who had charge of the monasteries of Normandy in the 11th century, all Norman work as well. *See* ROMANESQUE ARCHITECTURE.

LOMBARDY, a division of northern Italy, composed of nine provinces and embracing an area of 9,333 sq. mi. Lying south of the Alps, it comprises the well-watered plain of the River Po and its chief tributary, the Ticino. Lombardy is the most highly industrialized region of Italy, the important cities of Milan, the chief railway center of the country, Mantua and Pavia being within its confines. Lombardy is also an agricultural region of considerable importance. The chief products are wheat, rice, sugar beets, flax, oats, maize and rye. Immense quantities of fruits, particularly chestnuts, are grown. The vine is extensively cultivated on the hillsides, and everywhere mulberry trees remind one of the silk industry for which Lombardy is especially noted. Among the important minerals are zinc, iron, and copper. The quarries yield granite, marble and alabaster. Pop. 1928, 5,086,338.

History. Lombardy derives its name from the Kingdom of the Lombards established in the Po Valley by a Germanic tribe of that name in the 6th century. In 774 the northern Lombard dominions were annexed to the Frankish Empire and thereafter for many centuries Lombardy was a geographical term only, designating no political entity.

With the decay of the Holy Roman Empire in the 12th century the movement of free cities in Lombardy, already well developed (*see* LOMBARD LEAGUE), rose to its full sweep and dissolved Lombardy into a welter of petty city states. Gradually two city republics, Milan and Venice, acquired the bulk of Lombardy, and while Venice retained her republican forms until the French Revolution, Milan became a hereditary duchy and passed through the hands of various monarchs, French 1500-21, Spanish 1540-53, Austrian 1714. *See* MILAN.

The Austrian hold on Lombardy was broken by the French in 1797 and the region organized as the Cisalpine Republic until 1802. Later it became part of the Napoleonic Kingdom of Italy under the infant Napoleon II until, with the downfall of Napoleon, it was restored to Austria as the Province of Lombardy. In 1859 with the aid of France, Lombardy was annexed to the Kingdom of Sardinia which in 1861 became the Kingdom of Italy.

LOMBOK, an island of the Dutch East Indies, belonging to the Sunda group and with BALI forming a separate residency. It has an area of about 3,000 sq. mi. and is traversed by two chains of mountains. The Peak of Lombok, one of the highest volcanoes in the Dutch East Indies, rises to a height of 12,500 ft. Rice, maize, coffee, indigo, tobacco and sugar are the principal products. Cattle and horses are raised in considerable numbers. Mataram, on the west coast, is the chief town. Pop. 1925, 600,000. Pop. of the residency of Bali and Lombok in 1927, 1,586,652.

LOMBROSO, CESARE (1836-1909), Italian criminologist, was born at Verona, Nov. 18, 1836. After studies at Padua, Vienna and Paris, he was appointed director of an insane asylum at Pesaro, and later became professor of criminal anthropology at the University of Turin. Lombroso held that the criminal is the product of nervous disease, and ranked him in intelligence midway between the lunatic and the savage. His views provoked wide controversy, especially his contention that genius is a form of degeneracy, but his work prepared the way for the modern science of criminal psychiatry. In 1872 he discovered that pellagra, a disease prevalent among the Italian peasants, was caused by rotten maize. Lombroso took measurements of thousands of criminal types, and he reported his findings and conclusions in *The Criminal, The Causes of and Contest Against Crime,* and *The Man of Genius.* He died at Turin, Oct. 19, 1909.

LOMOND, LOCH, the largest lake of Scotland, in the counties of Dumbarton and Stirling, 15 mi. from Glasgow. Lomond is 25 mi. long, and has a number of wooded islands on its surface. A chain of hills, topped by Ben Lomond, 3,190 ft. elevation, circles the shore. More than 12 rivers flow into the loch, among them the Douglas, the Fruin, the Blair and the Falloch. The fish include sea and lake trout, pike, perch and salmon. Several famous caves, notably one called "Rob Roy's Prison" are near the lake.

LONDON, JACK (1876-1916), American author, whose baptismal name was John Griffith London, was born in San Francisco, Cal., Jan. 12, 1876. He entered the University of California, but left to join the Klondike gold rush and later tramped through Canada and the United States. In 1906 he started a world cruise in a 50 ft. yacht, but sickness prevented his completing it. London was an ardent socialist, and in his wanderings both lectured and wrote for this cause. *The Iron Heel, The War of the Classes* and *The People of the Abyss* are among his books that championed Socialism. His novels were based upon his adventures in far places, and include *The Call of the Wild, The Sea Wolf, White Fang, Martin Eden, Burning Daylight,* and *South Sea Tales.* London died at Glen Ellen, Cal., Nov. 22, 1916.

LONDON, largest city in the world, and capital of the British Commonwealth of Nations, is situated in southeastern England, on both north and south banks of the lower Thames, 40 mi. from its estuary. The "trade-mark of London," St. Paul's Cathedral, is in 51° 30′ 48″ N. lat. and 0° 5′ 48″ W. long. Greater London consists of the administrative county of London, which is divided into 28 municipal boroughs, and comprises the whole of the Metropolitan Parliamentary Division, together with the county of the City of London. This area, including the district covered by the City and Metropolitan Police, together with its outer ring of suburbs distributed over Middlesex, Essex, Kent, Surrey, and Hertfordshire, covers 443,449 acres, and has a population (1931) of 8,202,818.

The City is the historic heart of London, covering an area of only 675 acres. North of the Thames Greater London includes the metropolitan boroughs of City of London, properly a county corporate, City of Westminster, Bethnal Green, Chelsea, Finsbury, Fulham, Hackney, Hammersmith, Hampstead, Holborn, Islington, Kensington, Paddington, Poplar, St. Marylebone, St. Pancras, Shoreditch, Stepney, and Stoke Newington; south of the Thames, Battersea, Bermondsey, Camberwell, Deptford, Greenwich, Lambeth, Lewisham, Southwark, Wandsworth, and Woolich. London is built in and around the London Basin, through which the Thames meanders in long reaches. The northern bank, on which the city is laid out, consists of two rolling plateaux, rising toward the Hampstead hills. The south bank, below the city, is a flood plain, flat and marshy.

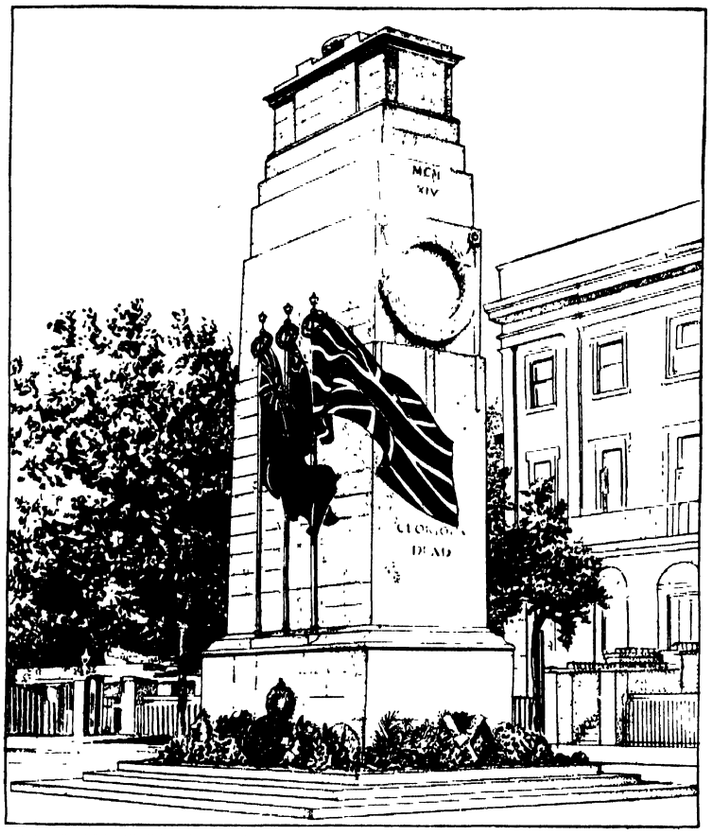
Commerce and Industry. London owes its high rank among the world's greatest centers to its rôle as mother-city of the British Empire. Its physical advantages are ideal to trade with the colonies. In 1931 there were 33 miles of docks, equipped with electric cranes, railway facilities and a vast system of bonded warehouses which store enormous quantities of wool, sugar, rubber, tea, refrigerated meat, lumber, grain, provisions, metals, rum, wine, brandy, spices, ivory, marble, ostrich feathers, tobacco, silk and other products of the colonies and of other nations. These docking facilities extend along the north bank from the Tower to Blackwall and on the south side between Rotherhithe and Deptford. These extensive docks are controlled by the Port of London Authority. Apart from London's ranking position as a port, the British capital is also the largest manufacturing center in the empire. These products include pottery, glass, hardware, electrical goods, clothing, woolen goods, silk, chemical drugs, books, brass works, jewelry, millinery, boots and shoes, and leather goods, while the city also contains the largest breweries, distilleries and sugar refineries in the kingdom.

Communications. As the center of the kingdom, London is a focal point for all the trunk railroads. The four great systems serving London are the London, Midland, and Scottish, with the Euston and St. Pancras terminals; London and Northeastern, with King's Cross, Marylebone and Liverpool Street terminals; the Great Western, with Paddington station; and the Southern system, with the Victoria and Waterloo stations. In the Greater London area all four systems are electrified in part. The Southern tracks to Croydon, site of the London Terminal Aerodrome which connects the capital with the Continental air services, are entirely electrified. Within London transportation from one section to another is provided by means of the extensive underground network of tubes, bus systems and the trolley services. The Metropolitan and Metropolitan District tubes have a mileage of 65¼ and reach most outlying districts of Greater London. The Thames is crossed by a number of tunnels constructed for the tube lines, for pedestrian and vehicular traffic and for the railroads. Within the County of London there are 14 road-bridges over the Thames. London Tower Bridge, a suspension bridge supported by two stone towers, was completed in 1894, and connects the city with Southwark and Bermondsey. Other celebrated structures over the river are Waterloo Bridge, oldest in London, and the iron Westminster Bridge. River transportation is provided by the Thames steamers.

Streets and Squares. London streets are not parallel throughout the metropolis but are laid out in relation to the line of the Thames. The most historic thoroughfares are the Victoria Embankment on the north side, lined with imposing public and private buildings, gardens and shady trees, and the Albert Embankment on the south side, above Westminster Bridge; Fleet Street, extending from Ludgate Hill to Temple Bar, which is devoted to newspaper, magazine and book publishing; Lombard Street, the financial district; Whitehall and Downing Streets, where most of the government offices are situated; the Strand, flanked by hotels, theaters, and restaurants; Piccadilly, extending for a mile between the Haymarket and Hyde Park Corner, celebrated for its shops, handsome restaurants and hotels; Bond Street, lined with jewelry shops; the Haymarket, celebrated for its theaters and hotels; and Pall Mall, center of club life.

Buildings and Monuments. The most central of the important public buildings is the Bank of England, on Threadneedle Street, where it was erected in 1734. Mansion House, residence of the Lord Mayor, is noted for its Egyptian Hall and Ballroom. The Houses of Parliament, rebuilt in 1840-50, are on the north bank, and comprise a Tudor Gothic structure 900 ft. in length on the river side. The clock at the end of the structure is the Big Ben of familiar allusion. The building encloses the House of Peers and the House of Commons, together with various apartments and Westminster Hall. Also on the north bank is the Tower of London, a celebrated moated fortress built in 1066-87 by William the Conqueror. The venerable edifice, covering an area of 12 acres and now used as a storage for armor, is chiefly famous for the prestige of its past prisoners, who included James I of Scotland, Anne Boleyn, Katherine Howard, Lady Jane Grey, Queen Elizabeth, Sir Walter Raleigh, and William Penn. During the World War the Tower was again used as a prison. Buckingham Palace, facing the west end of St. James's Park, has been the home of the royal family since 1837; to the north is the aristocratic district of Mayfair, and to the west is fashionable Belgravia. The Guildhall, dating from the 15th century, is the place of royal entertainment. The Inner and Middle Temple, south of Fleet Street, are on the site of the ancient edifice of the Order of Knights Templars. Important monuments include the Victoria Memorial, facing Buckingham Palace, the Cenotaph in Whitehall, erected in memory of the World War dead, Cleopatra's Needle on the Thames Embankment, the Nelson Column in Trafalgar Square, surrounded by

four lions, the Monument on Fish Street Hill, London Bridge, a column 202 feet high, erected after the great fire, the Florence Nightingale monument in Waterloo Place, and statues of Abraham Lincoln,



FROM PHOTO BY EWING GALLOWAY, N Y.

CENOTAPH "TO THE GLORIOUS DEAD" OF THE WORLD WAR, IN WHITEHALL, LONDON

facing Westminster Abbey, George Washington, in Trafalgar Square, and Wellington, on Hyde Park Corner.

Parks and Squares. London is generously provided with parks. Between Whitehall and Kensington there is an irregular belt of parks about 3 mi. long, consisting of St. James's, with a lake leading up to Buckingham Palace, the timbered Kensington Gardens, once part of the grounds of Kensington Palace, and Hyde Park, the scene of fashionable promenades since the 17th century. Other public grounds include Hampstead Heath, a high tract in the northwest, Wimbledon Common in the southwest, Putney Heath and Richmond Park, affording a view of the Thames basin. The oldest square in London is Covent Garden, dating from 1634; Soho, St. James's, and Leicester squares date from the reign of Charles II; and Grosvenor, Cavendish, Hanover and Trafalgar squares belong to the period of George II and later. Many of these attractive open areas enclose grass, flowers, trees and statues, and comprise one of the most agreeable physical aspects of the city.

Churches. The most celebrated church in London is St. Paul's Cathedral, at the top of Ludgate Hill, in the heart of the city. The parish church of the British Empire, it was designed by Sir Christopher Wren, and its erection was begun in 1675. The Gothic structure is 515 ft. long, with a maximum width of 102 ft. The diameter of its celebrated dome is 102 ft. The finest example of 13th century English architecture is Westminster Abbey, adjacent to the Houses of Parliament, where the coronation services have been held since Edward the Confessor. The cruciform edifice was begun in 1245, and is a magnificent Pointed adaptation of French Gothic. The north and south transepts contain the tombs of celebrated English subjects, and monuments to their memory. The British Unknown Warrior is buried in the center of the nave. Other noteworthy London churches are St. Bartholomew's in Smithfield, dating from 1123, Southwark Cathedral, and Saint Stephen's, Walbrook.

Museums and Galleries. The British Museum, located in Bloomsbury, the intellectual and artistic center of London, contains an unmatched collection of Egyptian, Assyrian, Greek, Roman, Etruscan, Cyprian and Indian antiquities, and priceless exhibitions of early books, bindings, manuscripts, prints and drawings. The building provides a reference reading-room for research students. The Victoria and Albert Museum contains a famous collection of paintings. The greatest art collection is housed in the National Gallery in Trafalgar Square. The Guildhall, a greatly restored 15th century building, in the City, contains an excellent library and museum.

History. London is first recorded in history in 54 B.C., when Julius Caesar landed in England. The Romans recognized the importance of its geographical position, specifically its location in relation to trade with the Continent. In A.D. 61 Queen Boadicea and her Iceni tribesmen captured the settlement from the Romans and sacked it. The Romans restored their authority, and held London for the next 350 years. After the fall of Rome, London declined in importance. In 839 the Danes wrested it from the Saxons, but Alfred recaptured the city, by this time a walled stronghold, and fostered its commercial growth. In the 11th century London was already a leading European center. Under William the Conqueror London received its first charter; the mayoralty of the city, making it a municipal corporation, was created under Richard I. In 1665 the bubonic plague broke out in the city with great virulence, and early the next year four-fifths of London was destroyed by fire. It was rapidly rebuilt, chiefly in stone and brick, and it was in this period of reconstruction that Sir Christopher Wren erected his churches and influenced the design of much of London. In 1700 London had a population of about 700,000; by 1801 it numbered 1,114,644. Under Queen Victoria, the ancient city became almost exclusively devoted to commerce. Between 1915 and 1918 London was repeatedly bombed by German Zeppelin and airplane raids, which killed 524 persons, and destroyed 174 buildings.

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LONDON, a city and county seat of Middlesex Co., a port of entry of Ontario, Canada, situated on the River Thames, 123 mi. southwest of Toronto, and about midway between that city and Detroit, Mich. London is an industrial center of a rich farming and stock raising country, and includes among its many manufactures, agricultural implements, hosiery, railroad shop products, foodstuffs, stoves and refrigerators. Transportation is afforded by several railroads. Well-built, London has many public utilities and buildings, handsome churches, several educational institutions including the University of Western Ontario, an airport having regular mail service, fine parks and recreational centers. The nomenclature of the English city of London is further carried out in street names. The city site was selected by Governor Simcoe in 1792, and in 1848 London was incorporated as a town; in 1854 as a city. Pop. 1921, 60,959; 1931, 71,148.

LONDON, DECLARATION OF, a document drafted by an international conference of experts held in London in 1909 to determine the status of neutral commerce in time of war. It grew out of the 14 Hague conventions of 1907 and was proposed by Great Britain despite the popular opposition in that country to both The Hague agreements and the subsequent Declaration of London. Public opinion influenced the government of Great Britain to refuse to ratify the document when drawn up, and again in 1911, when the ministry attempted to carry the measure in the Naval Prize Bill, the Imperial Conference then in session tried to sway the cabinet against it. It was the persuasiveness of Sir Edward Grey that put it through the House of Commons, only to be rejected by the Lords. As it stood at the outbreak of the World War, the Declaration of London included the following important regulations:

1) The right of capture of a blockade-runner applied only to a part of her voyage and was restricted to the blockading ships.

2) Pre-established lists of contraband and non-contraband were substituted for the customary decision of the Prize Court.

3) Ships carrying contraband were condemnable only if more than half the cargo was contraband.

4) Belligerents' ships could destroy a neutral vessel without taking it to port for judgment.

5) The transfer of an enemy vessel to a neutral flag was valid if executed more than thirty days before declaration of war.

6) A neutral vessel accompanied by any sort of warship of her own flag was exempt from search.

7) Belligerents in neutral vessels on the high seas were exempt from capture.

After the outbreak of the World War, the Allies announced through a British Order in Council that the Declaration of London, though not binding upon them, would be adhered to, with some reservations regarding contraband and blockades, though these modifications violated the article that made the declaration an "indivisible whole."

As the war progressed, subsequent orders in council altered and practically nullified the regulations. Finally, on July 7, 1916, the Allies announced their formal abandonment of the principles of the Declaration, on the ground that "these rules, while not in all respects improving the safeguards afforded to neutrals, do not provide the belligerents with the most effective means of exercising their admitted rights." J. Ba.

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LONDON, GREAT FIRE OF, the greatest conflagration in the history of the city, which occurred on Sept. 2, 1666 and lasted for four days, destroying nearly all of old London. It originated near London Bridge in a baker's shop in Pudding Lane on a Sunday. From the waterfront it spread on the second day to Cornhill and the section occupied by the wealthy merchants, and the third day reached the northern wall and passed the wall to the west. The fourth day the wind fell and the fire burned itself out. Four-fifths of the walled city was destroyed, 273 acres within the walls and 63 without being burned over. More than 13,000 houses and 87 churches were wiped out. The Royal Exchange, Guildhall, Custom House and St. Paul's Cathedral were ruined. A vivid account of the fire is given in Pepys's *Diary.*

LONDON, GREAT PLAGUE OF, the most destructive epidemic in the history of the city, occurring in 1665. Although England had been visited by plagues every five years for a half century, none approached the Great Plague in fearfulness. It began in the suburb of St. Giles in the Fields, and rapidly spread through the city. So rapidly did people die that the bodies were merely thrown into a great pit; carts went through the streets at night gathering the bodies. During the height of the plague, Charles II and his court left the city, and Parliament met for the short session at Oxford. Albermarle alone of Charles II's ministers stuck to his post. About 63,000 deaths in London in 1665 were credited to the plague.

LONDON BRIDGE, a bridge connecting the City of London with Bermondsey and Southwark. The picturesque Old Bridge, completed in 1209, formed a street with shops on either side, the Chapel of St. Thomas of Canterbury, and gates on which were exposed the heads of executed traitors. The New Bridge, about 180 ft. above the site of the former structure, was designed by Sir John Rennie and completed between 1824-31. It is built of granite, has five arches, and is 928 ft. long and 63 ft. wide.

LONDONDERRY or **DERRY,** a city, county borough, and chief town of County Londonderry, Northern Ireland, 95 mi. northwest of Belfast, overlooking the Foyle River. Originating about 546 in a monastery founded by St. Columba, it became one of the few walled towns of Ireland. Early harried by Danes, it was embroiled in continuous medieval wars and emerged in 1688 a Protestant center. The

Protestant cathedral, in the Perpendicular style, was completed by the city of London in 1633, but the Roman Catholic cathedral is modern. To-day Londonderry has considerable public works. Its staple manufacture is linen, and distilling, brewing, fishing and shipbuilding are important industries. Pop. 1926,

LONDON NAVAL PARLEY, THE, a conference to consider naval armaments, was opened in London on Jan. 22, 1930 by King George V. The participating nations were the United States, Great Britain, France, Italy and Japan. The delegates from the United States were Dwight W. Morrow, Secretary of Navy Charles Francis Adams, Hugh S. Gibson, Ambassador Charles G. Dawes, and Senators David A. Reed and Joseph T. Robinson. After deliberating for three months, the delegates signed, on Apr. 22, an agreement of which the following were the outstanding features: a reduction in the total tonnage of capital ships and submarines; the limitation of cruisers, destroyer leaders, and destroyer tonnage; rules for the replacement and disposal of surplus vessels; definitions of aircraft carriers, cruisers, destroyer leaders and destroyers; amendments of international law in regard to submarine warfare. The agreement was in five parts, parts 1, 2, 4 and 5 concerning all the participating nations, while part 3 concerned only the United States, Great Britain and Japan. Shortly after the signing by the delegates in London, the governments of their respective countries signified approval of the agreements reached.

LONDON UNIVERSITY, in London, England, a coeducational university, with faculties of arts, law, theology, science, engineering, economics, political science and music, and an annual enrollment of about 3,200 students. The institution was founded in 1836 as an examining body which could confer degrees. In 1900, however, it was reconstituted with powers both to examine and to teach. Its colleges and schools have not been brought together into one central group, but are scattered about the city. The colleges proper are: University, situated in Gower St.; King's, in Somerset House, and Goldsmith's, at New Cross. The most important schools of the university are: the London School of Economics, Houghton St.; the Imperial College of Science and Technology, South Kensington; the Slade School of Fine Arts; the Bartlett School of Architecture; Bedford College for Women, Regent's Park; the London Day Training College, Southampton Row; the Royal Holloway College, Englefield Green, Surrey, and the Southeastern Agricultural College, Wye, Kent. In 1920 the university received a site in Bloomsbury for new buildings. The chancellor in 1931 was the Rt. Hon. the Earl of Beauchamp.

LONG, CRAWFORD W. (1815-1878), American physician, was born in Danielsville, Georgia, on November 1, 1815. He attended and graduated from Franklin College, Georgia, in 1835, attended Transylvania University and graduated from the medical school of the University of Pennsylvania. After noting some accidental anesthetic effects of ether, he removed a small cystic tumor from the back of the neck of a patient under its influence in 1842, and continued to use ether in other cases, which have been certified and vouched for by resident physicians of his locality. However, Long did not publish reports of his results until 1846, and meanwhile Morton published the success of his use of ether as an anesthetic. He died in Athens, Georgia, on June 16, 1878.

LONG, JOHN DAVIS (1838-1915), American lawyer and legislator, was born at Buckfield, Oxford Co., Me., on Oct. 27, 1838. He was graduated from Harvard in 1857. After two years of teaching he entered Harvard Law School, and was admitted to the bar in 1861. He transferred his law office from Buckfield to Boston the following year. His legal work led him into politics and in 1875 he was elected to the Massachusetts House of Representatives, where he served four years. In 1879 he was elected lieutenant-governor of the state, and in 1880-83 served as governor. Entering Congress in 1883, he served until 1889, when he refused renomination. In 1897 he was appointed secretary of the navy in President McKinley's cabinet and served in that of Roosevelt until May, 1902, when he resigned. He died at Boston on Aug. 28, 1915.

LONG, JOHN LUTHER (1861-1927), American writer, was born in Pennsylvania in 1861. He studied law and practiced in Philadelphia, while writing. Literary success came when *Madame Butterfly* appeared in 1898. It was dramatized by David Belasco, and gave Puccini his theme for the opera of the same name. (*See* Madame Butterfly.) Long's work is delicately imaginative in quality and picturesque in setting. Among his novels are *Miss Cherry Blossom of Tokyo, The Way of the Gods,* and *Billy Boy.* He died at Clifton Springs, N.Y., Oct. 31, 1927.

LONG, in market parlance, a term denoting possession of Stocks or Bonds in excess of contracts to deliver. One who has bought stocks as a result of his belief that prices will rise is long of such stocks. A bull is long of stocks in contrast to a bear, who is short. Margin buyers constitute a large percentage of the long interest in the market. *See also* Short Selling.

LONG BEACH, a city and pleasure resort in Los Angeles Co., southern California, situated on San Pedro Bay, 20 mi. south of Los Angeles. It is served by bus and truck lines, the Pacific Electric and two railroads. The Signal Hill oil field, located at the city's northern limits, produces about 200,000 bbls. of oil daily. Citrus fruits and truck garden products are the chief crops of the countryside. The city's principal manufactures are machinery, motor cars, aircraft, soaps, vegetable and fish oils, worsted goods and petroleum products; there are also packing and shipbuilding plants. The aggregate factory output in 1929 amounted approximately to $54,000,000 and the retail trade reached a total of $78,572,612. The harbor with Los Angeles harbor makes an important commercial center. In 1931 a $9,500,000 harbor de-

velopment program was nearing completion. The traffic of the harbor in 1930 was worth $69,565,984. Long Beach was settled in 1890 and incorporated as a city in 1897. Pop. 1920, 55,593; 1930, 142,032.

LONG BEACH, a city in Nassau Co., on the southwestern shore of Long Island, N.Y., situated on a strip of sand in the Atlantic Ocean, 24 mi. southeast of Manhattan. It is served by the Long Island Railroad. Long Beach is a popular bathing and fishing resort. It was incorporated as a city in 1922. Pop. 1920, 282; 1930, 5,817.

LONG BRANCH, a seaside resort of Monmouth Co., N.J., situated on the southern branch of the Shrewsbury River and on the Atlantic Ocean, about 30 mi. south of New York City. It is served by the Pennsylvania and Central of New Jersey railways, and motor bus lines. In 1929 the value of the manufactures was about $5,000,000; the retail trade amounted to $12,572,617. Near the shore it is traversed by Ocean Avenue, which forms a part of a highway and residential boulevard connecting numerous resorts along the New Jersey shore. Long Branch was used for residence as early as 1790, and later became one of the most fashionable resorts in the United States. The Elberon section, in which General Grant spent many summers, contains many beautiful residences. President Garfield was brought to Long Branch shortly before his death in 1881. Pop. 1920, 13,521; 1930, 18,399.

LONGCHAMP, WILLIAM (?-1197), chancellor of England. He was made Chancellor of the Kingdom and Bishop of Ely by King RICHARD I, and about 1190, when Richard left England, Hugh of Durham and Longchamp became joint justiciars. Longchamp also became papal legate by appointment by the Pope. Because of continual disagreements Hugh forced him from office. Forced by his enemies to leave England, he joined Richard in Germany, and acted as the king's agent on many European missions. He died at Poitiers, France, in Jan. 1197.

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LONGE. *See* CAVESSON.

LONGFELLOW, HENRY WADSWORTH (1807-82), American poet, was born in Portland, Me., Feb. 27, 1807, the second son of a United States Congressman. He began in his teens, rather against his father's wishes, to write both poetry and prose, but when, on his graduation from Bowdoin College, he was offered the chair of Modern Languages there, he accepted it gratefully, and went abroad for three years to prepare himself for the post, leaving it later to fill the same position at Harvard. His first book, aside from some texts for schools, was *Outre-Mer,* 1835, sketches of foreign travel somewhat in the manner of WASHINGTON IRVING. *Hyperion, A Romance,* appeared in 1839, and in the same year Longfellow issued his first book of verse, *Voices of the Night.* Its success was immediate, and from that moment the poet entered into a popularity such as few authors ever know during their lives. *Ballads and Other Poems,* 1841, repeated the success. With the writing of EVANGELINE, 1847, Longfellow found his own peculiar vein, the treatment in verse of the legends and stories of the settlers of North America, of which *The Courtship of Miles Standish,* HIAWATHA, and TALES OF A WAYSIDE INN also made use.



CRAIGIE HOUSE, LONGFELLOW'S HOME AT CAMBRIDGE

Shortly after the appearance of *Hiawatha,* in 1853, Longfellow gave up his professorship to devote himself to writing, and finished his early project of translating Dante's DIVINE COMEDY, as well as his own rather ambitious and unsuccessful trilogy, *Christus.* He died in Cambridge, Mass., Mar. 24, 1882, idolized by his public; two years later a bust was erected to his memory in Westminster Abbey.

Longfellow had a limited gift, but he was nevertheless of importance to American letters. His devotion to the great European literary tradition as well as his earnestness in bringing the worth of his own country's legends to the attention of his fellow writers bore unmistakable fruit, in even such unlikely successors as WALT WHITMAN. Longfellow was under no delusions about the magnitude of his own powers, and looked forward to other American poets who should do well what he could only suggest. He presented the spectacle, much needed in his day, of an American who was at once a citizen of the world and a loyal son of his own country. *See also* AMERICAN LITERATURE.

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LONG ISLAND, a low, sandy island in the Atlantic Ocean off the mainland of New York State to which it belongs politically. It extends about 118 mi. east by north from the mouth of the Hudson River, and is separated from Connecticut by Long Island Sound. The surface has a mean elevation of 70 ft. above sea level and a maximum altitude of 380 ft. The north shore has numerous small bays and the southern margin has a secondary offshore coast in the form of a sand spit. Sections of this barrier beach are known as CONEY ISLAND, ROCKAWAY BEACH and LONG BEACH. Orient Point and Montauk Point are two peninsulas at the eastern end of the island.

The island is divided into four counties of which Kings, or Brooklyn, and Queens belong to the city of New York. Nassau County has many suburban villages and Suffolk is devoted largely to market gardening and duck farming. Various points along the coast, such as OYSTER BAY, GREAT NECK, PORT JEFFERSON, EASTHAMPTON and SOUTHAMPTON, are fashionable summer colonies.

LONG ISLAND, BATTLE OF, Aug. 27, 1776, an engagement of the REVOLUTIONARY WAR, which resulted in a British victory. Gen. Howe with about 20,000 British and Hessian troops embarked from Halifax in August with the intention of driving the Continental Army under Gen. Washington from New York. His success was almost a foregone conclusion, because of the superior number and training of his troops. On Aug. 22 he landed on Long Island near the Narrows. Stationed on Brooklyn Heights, overlooking New York, were 5,000 Continental troops under Generals Sullivan and Stirling. Sending two detachments to assault this force face-to-face, Howe himself undertook a flank movement, gaining Brooklyn Heights from the rear and utterly routing the Americans. Sullivan, Stirling and 1,100 of their officers and men were taken prisoners. Each army lost from 400 to 500 men killed and wounded.

LONG ISLAND CITY, a part of Queens Borough, Greater New York, situated on the East River and Long Island Sound, and served by steamships, the Long Island Railroad and rapid transit lines. The principal manufactures are automobile accessories, paint, candy, pianos and shoes. The site was first settled by the Dutch. In 1870 several villages were incorporated as Long Island City in Queens Co.; in 1898 the city was included in New York City.

LONG ISLAND UNIVERSITY, located at Brooklyn, N.Y., a non-sectarian, coeducational institution privately controlled, was provisionally chartered in 1926 by the Regents of the University of the State of New York. In 1929 the Brooklyn College of Pharmacy became a part of the university. The library contains 9,000 books. There was a student enrollment of 1,962 in 1931-32, and a faculty of 126 headed by Dean George R. Hardie.

LONGITUDE, in geography, the angle between the plane of the meridian of a given place, and that of the standard meridian of Greenwich. Longitudes are counted in degrees, eastward as well as westward from Greenwich, until, at the meridian opposite that of Greenwich both reach the value 180° (E or W). In astronomy longitude similarly indicates the angle, along the ECLIPTIC, between an object and the vernal EQUINOX; galactic longitude, the corresponding quantity measured along the great circle of the Milky Way.

LONGMONT, a city in Boulder Co. in northern Colorado, situated on the plains east of the Rocky Mountains, at an elevation of 4,950 ft., 35 mi. northwest of Denver. The city is served by three railroads and is an important shipping market for a rich irrigated region producing wheat, alfalfa, sugar-beets, livestock, dairy and poultry products. There are gold and lignite deposits nearby. Longmont has a beet-sugar refinery, flour and planing mills, and canneries. West of the city are great areas of national forest and to the northwest is Rocky Mountain National Park. Pop. 1920, 5,848; 1930, 6,029.

LONG MOSS (*Tillandsia usneoides*), a perching plant (epiphyte) of the bromelia family called also Spanish moss and old-man's-beard. It is very widely distributed in tropical America and in the southern United States, extending northward to Virginia. The very slender, thread-like stems, 3 to 20 ft. long, hang in festoons from the branches of trees and, like the filiform leaves, are densely covered with a silvery scurf. Although not a moss but a true flowering plant, the small yellow blossoms appear but rarely. The plant is usually distributed from tree to tree by the wind or by birds, which use its hairlike leaves and stems for building nests. In the Gulf States long moss grows very abundantly on liveoaks forming a conspicuous feature in the vegetation. The tough black central strand of the stem furnishes a valuable fiber used like horsehair.

LONG PARLIAMENT, THE, the name commonly given to the fifth and last parliament of CHARLES I which met on Nov. 3, 1640, and sat, with interruptions, for almost 20 years. It carried on the Civil War, and finally dissolved itself on Mar. 16, 1660. There was much conflict in the parliament between the partisans of Charles and the leaders, Pym, Hampden and others, of the popular party; in 1648 Cromwell, supported by the army, expelled all but 50 members by what is known as "PRIDE'S PURGE." This remnant, known as the "RUMP PARLIAMENT," continued to function. It sentenced Charles I to death and sanctioned Cromwell's Commonwealth. Afterward it was twice dismissed by Cromwell, but reassembled each time, once after a lapse of five years. Finally, it agreed to dissolve, after providing for a general election. *See* OLIVER CROMWELL.

LONG RANGE MOUNTAINS, the highest uplift in NEWFOUNDLAND, situated along the entire west coast of the island. The average elevation of the range is only 2,000 ft. but it presents a majestic appearance from having its base practically at sea level. The greatest elevation is the Lewis hills about halfway between the Bay of Islands and St. George Bay where 2,700 ft. is reached. The range faces the west with an almost vertical front, in some places reaching the sea but usually with an intervening foreland. Its slope to the east is gradual, the crestline is strikingly horizontal and many of the mountains have table tops.

LONGS PEAK, a summit of the Front range in Boulder Co., Colorado, about 50 mi. northwest of Denver. It reaches an altitude of 14,255 ft. above sea level, being one of the 46 Rocky Mountain peaks in Colorado to exceed 14,000 ft. The crest is perpetually clothed with snow and snow banks along the streams extend down into its forests of fir and pine. The peak is named for Maj. S. H. Long who in 1820 led an exploring party into the Arkansas val-

ley and was the first person to ascend it. From its summit range after range is visible with PIKES PEAK over 100 mi. to the south.

LONGSPUR, the name given to several small birds of the FINCH family (*Fringillidæ*), characterized by having an unusually long, straight, spur-like hind claw. They are gregarious, ground-loving birds with more or less variegated black, chestnut, buff and white plumage. In size they are usually slightly smaller than the English sparrow, and are found mostly in far northern regions, nesting on the ground and laying three to six whitish speckled eggs. They utter short sweet notes, often when on the wing, and feed chiefly on insects, weed seeds and grain. Four species occur in North America. Of these the best known are the Lapland longspur (*Calcarius lapponicus*), found in all circumpolar regions and in North America wintering southward to Texas, and the chestnut-collared longspur (*C. ornatus*), which breeds from Saskatchewan to Kansas and winters southward far into Mexico.

LONGSTREET, JAMES (1821-1904), American Confederate general, was born in Edgefield, S.C., Jan. 8, 1821. He graduated from West Point in 1842, and served with great gallantry in the Mexican War. When the Civil War broke out he joined the Confederate forces, with the rank of brigadier-general. His ability as a leader was conspicuous in the first battle of Bull Run (for which he was appointed major-general), in the Peninsular campaign and second battle of Bull Run, and after Fredericksburg he was promoted to lieutenant-general. At Gettysburg he presented a most formidable front of the Confederate line and was in the most stubborn of the fighting. He is credited with the Confederate victory at Chickamauga and distinguished himself in the Wilderness. After the war he engaged in the cotton business in Louisiana, became a Republican in politics and held several Federal appointments, among them being Surveyor of Customs at the port of New Orleans (1869-73), that of U.S. Minister to Turkey (1880-81) and U.S. Railway Commissioner (1898). Died at Gainesville, Ga., Jan. 2, 1904.

LONGUS (2nd century A.D.), Greek writer, was probably born on the Island of Lesbos, in the latter part of the 2nd or beginning of the 3rd century. He is known as the author of DAPHNIS AND CHLOE, the romance of two children found and brought up by shepherds. Longus's style is conventional, but modern in its analysis of character. Little is known of his life. *See also* GREEK LITERATURE.

LONGVIEW, a city and county seat of Gregg Co., northeastern Texas, situated near the Sabine River, 126 mi. southeast of Dallas. Three railroads and bus lines serve the city. In Nov. 1930, "Dad" Joiner discovered oil in Rusk County, a short distance to the south, starting a boom that resulted in the extremely productive East Texas Oil Field. Dec. 28, 1930 a well was discovered between the towns of Kilgore and Overton and on Jan. 20, 1931 the Moncrief Farrell No. 1 Well was started near Longview. By 1932 some 106,000,000 barrels had been produced, and all the nearby towns had felt the effects of the discovery in increased population. Cotton and vegetables are the chief crops of the region; the local manufactures are plows, boxes and lumber. The Capps Mineral Wells are located here. James S. Hogg, a noted governor of Texas, and W. J. McDonald, Texas ranger and captain of Pres. Woodrow Wilson's bodyguard, were born here. Longview was founded in 1872. Pop. 1920, 5,713; 1930, 5,036. The city's population since the discovery of oil is estimated at 15,000.

LONGVIEW, an inland port and city in Cowlitz Co., southwestern Washington, situated at the confluence of the Columbia and the Cowlitz rivers, 50 mi. northwest of Portland, Ore. It is served by the Longview, Portland and Northern, Great Northern, Northern Pacific & Union Pacific railroads and by steamships. Timber and coal are found in this region, and the district is also agricultural. There are commercial fisheries. The chief industries are lumber, pulp and paper manufacture. In 1929 the retail trade reached $6,697,300. The ocean-going traffic of Longview harbor in 1929 amounted to 417,199 tons worth $10,763,854. Longview was incorporated in 1924. Pop. 1930, 10,652.

LONGWALL. *See* MINING, COAL.

LONGWORTH, NICHOLAS (1869-1931), American legislator, born at Cincinnati, O., on Nov. 5, 1869. He was graduated from Harvard University in 1891, took up the study of law, and was graduated in law from Cincinnati Law School in 1894. He was admitted to the bar in the same year. He became a member of the Cincinnati Board of Education in 1898. Elected to the state legislature in 1899, he served one term, and then was elected for one term to the state senate. In 1903 he was elected to the House of Representatives, and served until 1913. He was reelected in 1915 and thereafter until his death, for the first Ohio district. In 1906 he married Alice Roosevelt, daughter of THEODORE ROOSEVELT. He was a member of the Ohio Republican State Committee, a member of the executive committee of the Republican Congressional Committee, and was Republican floor leader in the House from 1923 to 1925. In that year he became Speaker of the House, and remained in that position until his death. He died on Apr. 9, 1931.

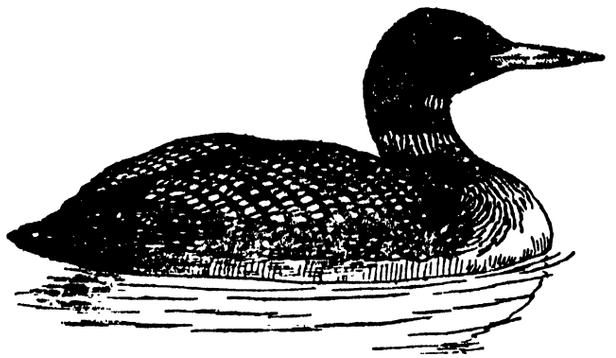
LOOKOUT MOUNTAIN, a steep ridge rising 1,600 ft. above the Tennessee River to an elevation of 2,126 ft. above sea level, located south of Chattanooga on the borderline between Tennessee and Georgia. The summit commands magnificent views in five states including the beautiful Tennessee Valley, the city of Chattanooga and the adjacent mountain region.

LOOKOUT MOUNTAIN, BATTLE OF, Nov. 24, 1863, in the CIVIL WAR, an operation of the BATTLE OF CHATTANOOGA. Simultaneously with Gen. Sherman's assault against Missionary Ridge (*see* MISSIONARY RIDGE, BATTLE OF), Gen. Hooker, with three

divisions of the Federal army under Generals Osterhaus, Geary and Cruft, moved against the Confederate works upon Lookout Mountain, west of Chattanooga. The Confederate pickets were dislodged, and by noon the Federal force had gained open ground on the north slope, directly confronting Confederate artillery. The ensuing attack, sometimes called the Battle in the Clouds, carried the Confederate defenses before it. By evening the Federal troops were in undisputed possession of the mountain. During the night Gen. Bragg and the Confederate army abandoned the vicinity.

LOOMING, the name given to a form of MIRAGE observed at sea in foggy weather, when distant objects appear closer and larger than they really are. It is caused by a peculiar distribution of the density of the air surrounding the observer which acts as a lens.

LOON, the name of a family (*Gaviidæ*) of web-footed aquatic birds closely allied to the GREBES and known also as DIVERS. There are five species widely distributed in north temperate regions, breeding northward to within the arctic circle and wintering, especially along ocean shores, throughout the temperate area. They are large birds, 2 to 3 ft. long, with rather long necks, sharp-pointed bills, strong wings and short legs placed very far back on the body. In summer their plumage is blackish or slaty above, thickly speckled or spotted with white, and white below, with the throat blackish or chestnut; in winter their plumage is gray with white markings above and the throat is white.



G. M. SUTTON, "BIRDS OF PA." J. HORACE MC FARLAND CO. COPYRIGHT

COMMON LOON

Though strong swift flyers, loons hesitate to take wing and are very awkward on land. They feed almost exclusively on fish, for which they dive with extreme agility. Their unusual call is a loud startling cry somewhat like the lugubrious howl of a wolf or the screaming of a human being in great distress. Loons build rude nests, usually near the water, and lay two large, dark brownish, somewhat spotted eggs.

The largest species, the common loon (*Gavia immer*), called also great northern diver, though breeding mostly northward, winters widely throughout the United States; the much smaller red-throated loon (*G. stellata*) and the Pacific loon (*G. arctica*), which breed far northward, visit the United States only in winter. All the foregoing occur also in Europe and Asia. *See also* DIVING BIRDS. A. B. J.

LOOP ANTENNA, a coil of wire usually tuned with a CONDENSER across its terminals, used to behave either as a collector or radiator of wireless signals (*see* ELECTROMAGNETIC WAVES). If there are several turns of wire in the loop, they are often wound in one plane. In this case, the loop has marked directional characteristics, receiving or transmitting efficiently only in the plane of the loop. *See also* RADIO COMMUNICATION; RADIO BEACONS AND DIRECTION FINDERS.

LOOSE COUPLER, two coils arranged as an air-core TRANSFORMER in a CIRCUIT designed for high frequencies. Ordinarily, one coil is movable with respect to the other, so that the degree of coupling of the two coils may be varied.

LOOSESTRIFE, a genus (*Lysimachia*) of perennial herbs of the primrose family, several of which are more or less cultivated. There are about 100 species found widely in temperate and warm regions, some 10 of which occur in North America, chiefly in the eastern United States. Among Old World species grown in gardens and naturalized in the United States are the golden loosestrife (*L. vulgaris*), the spotted loosestrife (*L. punctata*) and the creeping loosestrife or MONEYWORT (*L. Nummularia*).

LOPEZ, CARLOS ANTONIO (1790-1862), President and Dictator of Paraguay, was born in Asuncion Nov. 4, 1790. At the death of Francia, his uncle, he was elected first consul, and from 1844 to his death, Sept. 10, 1862, was President. He developed the industrial resources and military strength of the country.

LOPEZ, FRANCISCO SOLANO (1827-70), President and Dictator of Paraguay, was born at Asuncion, July 24, 1827. At 18 he became commander-in-chief of the army, and in 1862 succeeded his father (*see* LOPEZ, CARLOS ANTONIO) as President. Aspiring to play a Napoleonic rôle in South America, he seized the occasion of Brazil's military intervention in Uruguay to attack both Brazil and Argentina. With Uruguay the latter formed a Triple Alliance and invaded Paraguay in 1866. After four years of warfare Lopez was killed near the Aquidaban River, Mar. 1, 1870.

LOPEZ DE GOMARA, FRANCISCO (1510-1560), Spanish historian and priest. He studied and traveled in Italy, and later returned to Spain where, about 1540, he became chaplain in the family of Hernando Cortes. His contact with Cortes inspired and aided him in the writing of his famous *Historia de las Indias.* He also had the advantage of data given him by Andres de Tapia and Gonzalo de Umbria, who had taken part in the conquest of America, and of Sebastian Cabot. His history, which was finished and published in Zaragoza in 1552, was an immediate success and other editions were promptly published, but it did not meet with the approval of the crown, and its publication was stopped. Only in 1727 did the government of Spain remove the ban

placed on this history. Though probably too much influenced by the author's close association with Cortes, it is considered one of the most reliable sources for the study of the conquest of Mexico. The Spanish historian and critic, Menendez y Pelayo, has called it the first work on America worthy of the name of history rather than chronicle.

LOQUAT (*Eriobotrya japonica*), a small handsome evergreen tree of the rose family cultivated for its pleasant edible fruit and ornamental foliage. It is a native of Japan and China and widely grown in subtropical regions, including the Gulf states and southern California. The erect trunk bears numerous branches with rusty hairy branchlets, stiff, oblong glossy leaves, sometimes a foot in length, and fragrant white flowers in terminal clusters, blooming in October or November. The yellow, agreeably acid, oblong or somewhat pear-shaped fruit, containing a few large seeds, matures in the following spring. Because of inferior shipping qualities the loquat is utilized chiefly as a home fruit, especially for desserts and making jellies.

LORAIN, a city of northern Ohio, on the southern shore of Lake Erie, situated at the mouth of the Black River, about 25 mi. west of Cleveland. The transportation facilities include the Baltimore and Ohio and the Nickel Plate railroads, Great Lake steamboats, bus lines and an airport. The city is located on a beautiful scenic highway following the lake shore. There is an excellent harbor and the Black River is navigable to the largest boats for three miles. Lorain is a shipping point for farm products, coal, lumber and iron ore. Among the leading manufactures are steel ships, rails, steam shovels and stoves.

The retail trade in 1929 amounted to $19,628,472 and the total manufactures to $140,545,209. In 1787 a Moravian mission was established here, and a trading-post followed in 1807, but a permanent settlement was not made until about 1822. The village was incorporated in 1836 under the name Charleston. Later the present name was adopted and in 1895 Lorain was incorporated. Pop. 1920, 37,295; 1930, 44,512.

LORCA, a city of Spain, in the province of Murcia situated in the valley of the Sangonera. The old city is built on the hillside, and the newer section spreads over the level land below. Lorca has extensive lead, silver and sulphur mining, and produces oil, grain, powder, woolen goods, leather, chemicals and china. Est. pop. 1929, 75,000.

LORD JIM, a novel of the sea by JOSEPH CONRAD, published 1900, one of the series of tales told by Marlowe. This is the tragic story of Jim, a young, imaginative, thoroughly honorable officer in the mercantile marine, who deserts his ship one dark night in a moment of apparent danger, and for this irretrievable mistake feels himself forever dishonored in the eyes of men. He goes to a Malayan jungle settlement where he shall be the only white man, and there rebuilds his life until, confronted with one final crisis, he fails again and dies tragically.

LOREE, LEONOR FRESNEL (1858-), American railroad president, was born at Fulton City, Ill., April 23, 1858. Loree began his career as a rodman for the Pennsylvania Railroad, then serving as division superintendent and as general manager, and finally as fourth vice-president. In 1901-04 he was president of the Baltimore & Ohio Railroad, and of the Rock Island Railroad Company (1904). He became president of the Delaware & Hudson Railroad in 1907. Loree built the first high-pressure locomotive, and invented the "upper-quadrant" system of semaphore signalling. He is widely known for his advocacy of railroad consolidation.

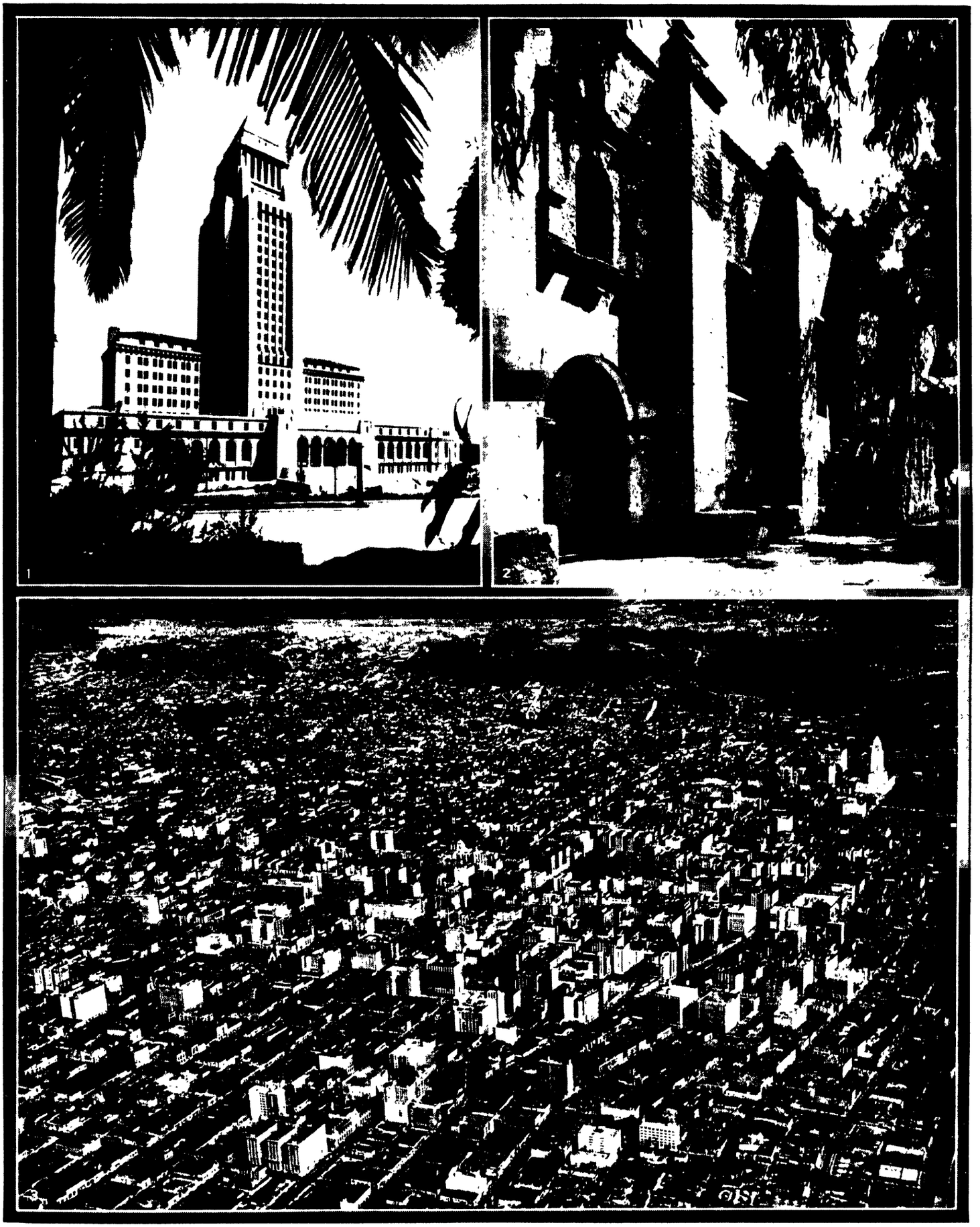
LORENTZ, HENDRICK ANTOON (1853-1928), Dutch physicist, was born at Arnheim, July 18, 1853. From 1878 to 1923 he was professor at Leyden. He evolved the electronic hypothesis, applying thereto the Maxwell-Hertz equation of light and magnetism. Works in which he expanded his discoveries and theories include *The Electromagnetic Theory of Maxwell and its Application to Moving Bodies,* 1892, *Visible and Invisible Motions,* 1900, and *The Electronic Theory,* 1905. In 1902 he shared with Zeeman the Nobel Prize in physics. Lorentz died Feb. 4, 1928.

LORENZ, ADOLPH (1854-), Austrian orthopedic surgeon, was born at Vidnava, Silesia, Apr. 21, 1854. After long study, he designed a manipulative operation for the cure of congenital dislocation of the hip which avoided the deep muscle cuts of operative methods. He likewise advanced the treatment of clubfoot. Dr. Lorenz has demonstrated his operative methods in England and United States.

LORENZINI, CARLO (1831-90), Italian author, whose pseudonym was C. Collodi, was born in Italy in 1831. He wrote fiction and stories for children. His most successful book for children, *Pinocchio,* the adventures of a puppet, has become an international classic, and has been successfully dramatized in many countries. Lorenzini died in 1890.

LORETTO NUNS, the popular name for members of the Institute of Mary (officially, Institute of the Blessed Virgin Mary), especially those of the Irish branch; in Italy and Germany, the "English Ladies." Five distinct branches have a common origin in the Institute established in Rome, 1633, by Mary Ward to carry on, in a revised form and with papal approbation, the work of her first congregation, suppressed in 1630. It is a teaching order and is not cloistered. The separate generalates, Bavaria (as constituted by the original Institute), Austria, Mainz, Toronto (Canada), and Ireland (an extensive branch with mother-house at Rathfarnham, established in 1822 by Frances Ball), have each several subject houses, the total exceeding 225, distributed among the United States and Canada, England, Ireland, Germany, Austria, Czechoslovakia, Rumania, Hungary, Italy, Spain, Africa, India and Australia. The total membership is about 7,000.

LORIENT, a military and commercial port located on the south coast of Brittany, department of



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VIEWS OF THE CITY OF LOS ANGELES

1. The Los Angeles City Hall with its skyscraper tower. **2.** The San Gabriel Mission in Los Angeles County, a distinctive example of Spanish mission design. **3.** Air view of the Los Angeles business district with its cluster of skyscrapers.

Morbihan. Established in the middle of the century as a base for the French Compagnie des Indes, the port was called L'Orient. When India became British, the company failed and the city was taken over by the state in 1770. Napoleon developed the naval station. Pop. 1931, 42,853.

LORIMER, GEORGE HORACE (1868-), American writer and editor, was born in Louisville, Ky., Oct. 6, 1868, and educated at Colby College and at Yale. He worked as a newspaper reporter and correspondent until 1897, when he became literary editor of the *Saturday Evening Post;* 2 years later he was made editor in chief of this publication. Lorimer is the author of *Letters of a Self-Made Merchant to His Son,* 1902, *Old Gorgon Graham,* 1904, and other works.

LORIS, a lemur native to Indo-Malaysia. The slender loris (*Tardigradus tardigradus*), found only in the lowland forests of Madras and Ceylon, is smaller than a squirrel; the slow loris (*Nycticebus coucang*) is about the size of a small cat. Both creatures are characterized by the weird expression of their very large, brilliant, prominent eyes, by a rudimentary tail, by long, slim legs, and by imperfectly developed index fingers. Their fur is dense, fine, and soft. By day they sleep in a coil, all four hands grasping the limb of a tree and their heads tucked among their legs. At night they wander in search of food, which consists of young leaves and shoots, fruits, insects, birds and their eggs. Loris are astonishingly deliberate in their movements. The slender loris approaches its prey like a chameleon, in almost imperceptible advances.

LORNA DOONE, a glamorous romance of 17th century brigands in western England, by R. D. Blackmore; published 1869. The chief scene is Doone Valley in Exmoor, the time about 1673-87. John Ridd, a stalwart boy of 14, one day in his wanderings meets Lorna, daughter of the famous robber Doones, and swears that he will rescue the girl from her family. He makes good the oath some seven years later when he carries Lorna away to a church to be married—only to have his bride shot at the conclusion of that ceremony by Carver, the last of the Doones. But Carver dies, and Lorna is soon healed of her wound. Minor characters are the humorous Tom Faggus and the infamous Judge Jeffreys. The book abounds in delightful descriptions of Nature.

LORRAIN, CLAUDE. *See* Claude Lorrain.

LORRAINE, the name given to the territory allotted to Lothair by the Treaty of Verdun in 843, which formed a middle kingdom between the possessions of his brothers, Louis the German and Charles the Fat. After Lothair's death the kingdom of Lorraine was fought for by both Germany and France, and was divided between them in 870. In the 10th century Lorraine was brought under German domination and divided into Upper Lorraine, forming the territory from the headwaters of the Meuse and Moselle rivers to Andernach on the east and Bouillon on the west, and Lower Lorraine, comprising the land on the left bank of the Rhine reaching almost to the sea and including the duchies of Brabant and Hainault. Lower Lorraine fell to the dukes of Brabant in the 12th century. Upper Lorraine, to which the name Lorraine was restricted after the 11th century, had its own line of dukes from that time onward. Among them were the members of the House of Guise who played an important rôle in the religious struggles of the 16th century. In the 18th century Duke Francis III married Maria Theresa of Austria, and France, who would not allow the union of Austria and Lorraine, secured the abdication of Francis, compensating him with the Duchy of Tuscany in Italy. Stanislaus Leczinski, erstwhile king of Poland, was given Lorraine with the understanding that upon his death the dukedom would revert to France. This occurred in 1766. With the abolition of the old provinces by the Revolution Lorraine was divided into the departments of Meuse, Moselle, Meurthe and Vosges. For the subsequent history of Lorraine, *see* Alsace-Lorraine. S. B. C.

LORRIS, GUILLAUME DE. *See* Guillaume De Lorris.

LORY, a family (*Loriidæ*) of handsome parrots native to Australia, New Guinea and the adjacent islands. There are about 85 species, all small birds, usually less than 10 in. long, with tongues brushlike at the tip, strong wings, short tails and often brightly colored plumage. Lories are noisy birds frequenting wooded districts and often moving in large flocks. They feed largely upon soft fruits and the nectar from flowers, and breed in hollow trees. One of the most handsome is the purple-capped lory (*Lorius domicella*) of Ceram and Amboina, with scarlet, yellow, green and purplish-black plumage. It is highly esteemed as a pet because of its gentle disposition and its power to imitate various sounds.

LOS ANGELES, 5th largest American city, the seat of Los Angeles Co., is situated in southwestern California, 16 mi. inland from the Pacific Ocean, at 34° 3′ N. lat. and 118° 14′ W. long. The city lies on a level site in the valley of the Los Angeles River, which bisects the city. The city is 10 mi. south of the Sierra Madre Range, while the foothills of the San Gabriel Mountains give a hilly character to the northern part of the city. San Francisco is 475 mi. northwest. Los Angeles has an area of 441.8 sq. mi. or one-third of the size of Rhode Island, the largest of any city in the world. In 1920 its population was 576,673; in 1930, 1,238,048, marking an increase of 114.7% over the census of 1920. The foreign population is approximately 300,000, which includes about 60,000 Mexicans, 22,000 Japanese and 2,500 Chinese. The average elevation is 275 ft. above sea level, with a maximum elevation at Mt. Hollywood of 1,692 ft. Readings taken during a period of 50 years by the United States Weather Bureau give Los Angeles a mean temperature of 63° F., with a yearly average of only 10 sunless days. In January the average temperature at Los Angeles is 55° F., in July 70° F. The average annual precipitation is 15.23 in. In addition

to its commercial importance, Los Angeles is internationally known as the motion picture capital of the world; in 1927 the Hollywood studios produced 84% of all film entertainment in the United States. *See also* HOLLYWOOD; MOTION PICTURES.

Geographic Setting. Los Angeles has spread in every direction over the level land of its valley, absorbing a succession of towns and villages, and accordingly is irregular in outline. The "shoestring strip," to the south, about 20 mi. in length, was acquired to provide the city access to the ports of Wilmington and San Pedro, which have been incorporated into Los Angeles, together with Venice, a shore resort north of San Pedro. This move gave Los Angeles, properly an inland community, a magnificent harbor which proved an important factor in the phenomenal growth of the city. In its ever-increasing spread Los Angeles has surrounded several other municipalities, among them Santa Monica, San Fernando and Beverly Hills. Westward extension of the city was blocked by high foothills, now opened to development by boulevards and tunnels. Beyond these foothills, or Santa Monica Mountains, much territory lying in the San Fernando Valley to the north has been annexed, and this area is to-day dotted by many individual communities. Nearer the city proper is Hollywood, 8 mi. northwest of the business section, formerly a separate city, but consolidated with Los Angeles in 1910.

In 1913 the San Fernando Reservoir, the first unit of the vast Owens River Aqueduct, was completed after five years of work. The Aqueduct, 230.09 mi. in length and constructed at a cost of $24,600,000, carries a normal flow of 194,000,000 gals. of water each 24-hour day from the high Sierras to Los Angeles.

Streets and Buildings. Los Angeles is regularly laid out in groups of rectangular developments, but because of the nature of the city's expansion the streets in one group are not always parallel with those of another section. The general direction of the city is north and south. In the business section, west of the bed of the Los Angeles River, the streets are laid out at right angles to the diagonal points of the compass; in the residential districts and numerous "developments," the streets are at right angles to the direct points of the compass, excepting where winding boulevards are made necessary by the foothills. The chief thoroughfares in the business area, lined by tall office buildings and retail shops, are Broadway and Main, Spring, Hill and Seventh streets. Since 1925 a civic center has been under development. Its first building was the City Hall, a rectangular structure with a high white central tower, constructed at a cost of $7,000,000 and dedicated in 1928. The second public building was the Hall of Justice. The chief business thoroughfares extend eastward over the Los Angeles River by way of bridges and viaducts and lead to the railroad terminals and the manufacturing district. The scattered residential sections are reached by boulevards, often lined by orange trees, palms, acacias and tropical flora. The pleasing effect is heightened by the prevailing Mission style of residential architecture, which gives the city a Spanish character. Chinatown and a considerable Mexican quarter, circling the old Plaza Park, formerly the center of the city, are in the north section of Los Angeles. The Japanese colony is centered around First Street east of Main.

Parks. The wealth of the city is reflected in the extent of its parks, which are 60 in number and have an aggregate area of 5,067 acres. Chief among them is Griffith Park, 3,751 acres, a wooded tract with a golf course north of the city, said to be the largest municipal park in the nation; Exposition Park, 114 acres, the site of the Los Angeles Museum; Elysian Park, 599 acres, a natural park in the northwest section; and Lincoln Park, 46 acres, containing a zoo. Popular recreation grounds outside Los Angeles visited by residents and tourists include Catalina Island, 23 mi. southwest of San Pedro Harbor (*see* SANTA BARBARA ISLANDS), and MT. WILSON and MT. LOWE, northeast of the city.

Transportation. Los Angeles is the focal point of transcontinental and other rail lines converging in the southwest. Freight and passengers are carried from the east by the Atchison, Topeka and Santa Fé, via Kansas City, the Union Pacific via Ogden, the Southern Pacific via New Orleans and the Rock Island via El Paso. The Southern Pacific Railroad also provides direct service to San Francisco and thence to the northwest. The elaborate suburban system of the Pacific Electric Railway, with 1,119 mi. of tracks, is a passenger and freight carrier in the territory with a radius of over 70 mi. There is fast service between the city and the harbor at San Pedro. A short subway system, constructed to accelerate the running-time of the electric interurban system to the northwest, was completed in 1926 and has a terminal building in the business section. Within the city the Los Angeles Street Railway system operates cars over 375 mi. of tracks. Los Angeles is the terminal of several national highways, traversed daily by fleets of transcontinental bus and motor truck lines. The municipal government has a Department of Aviation, which regulates the three airports, Allen Field, located at San Pedro, Griffith Park and Los Angeles Airport. Freight and passenger service by air is regularly maintained with all points in the United States, and the city is the western terminal of three transcontinental air services.

What were once Wilmington and San Pedro harbors, now the municipally-owned harbor of Los Angeles, is the largest port in intercoastal traffic in the United States and ranks next to New York in volume of ocean tonnage. The harbor is protected from severe storms by a breakwater 2½ mi. long, completed by the Federal Government in 1910 at a cost of $3,100,000. In the period 1912-14, the city, after annexing San Pedro and Wilmington, built an inner harbor and has since constructed docking facilities for transpacific and other large vessels. The water

front is 40 mi. in length and in 1931 was served by 152 steamship lines reaching to all ports of the world. The port was given tremendous impetus by the opening in 1914 of the Panama Canal, for which Los Angeles Harbor (San Pedro) became the chief Pacific terminus. The harbor is served by the system of the Pacific Electric Railway and the Harbor Belt Line Railroad.

Commerce and Industry. The commercial and industrial growth of Los Angeles during the decade 1920-30 was unsurpassed by any municipality in the world. In 1910 exports were valued at $135,911; in 1930 exports were valued at $146,108,000. Of these exports approximately 60% was petroleum, production of which in the Los Angeles district is valued at $130,000,000-$200,000,000 yearly. Other exports among natural products include copper, salt, soda, borax, potash, silica, talc, graphite, marble and onyx, all mined within a radius of 300 mi. Imports consisting chiefly of lumber, rubber, silk, coffee, copra, kapok, sesame seed and cocoa, were valued in 1930 at $50,156,000. In 1914 manufactures were valued at $103,500,000, as compared to approximately $745,000,000 in 1929. The leading industries are oil refining, motion picture production, with an investment in studio property in 1929 of $58,000,000, machinery, building materials, furniture, meat-packing, clothing, glass, chemicals, rubber tires, cements and paints. Since 1928 airplane manufacture has become an important industry. The city is the market place for the varied agricultural products of Los Angeles Co., including oranges, lemons, apricots, peaches, almonds and vegetables. In 1929 the retail trade amounted to $914,071,232. In the same year the wholesale net sales of Los Angeles, city and county, all establishments, were valued at $1,464,307,241. The California Fruit Growers' Exchange, an efficient cooperative marketing organization, has headquarters in Los Angeles. In 1930 bank debits were $12,071,297,027.

History. The future site of Los Angeles was first visited in 1769 by Gaspar de Portola, a Spanish colonist. It was named "Our Lady Queen of the Angels," and a pueblo was founded by Felipe de Neve in 1781. The settlement had a turbulent history after the Mexican revolt from Spanish rule. In 1835 Los Angeles became a city by declaration of the Mexican Congress, and during 1845-47 it was the capital of California. In the Mexican War the city's defenders fled upon the approach of 400 men under Robert F. Stockton, commander of the Pacific fleet, and the city was occupied by American troops on Aug. 13, 1846. In 1850 Los Angeles was incorporated. Twenty years later its population did not exceed 6,000, but in 1876 railroad communication was established with San Francisco, and in 1890 Los Angeles entered upon its era of phenomenal growth.

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LOSSIEMOUTH, a police burgh of Elginshire, Scotland, on the River Lossie, about 167 mi. north of Edinburgh, and including the villages of Stotfield, Branderburgh and Lossiemouth. Ramsay MacDonald was born here. Stotfield, a modern development, boasts golf courses and bathing facilities that make it an increasingly popular resort. The growth of Branderburgh on the north has paralleled harbor improvements since 1830. Together with its resort activities, the town builds boats, has fisheries, and serves as a port to Elgin, about 5 mi. southwest. Pop. 1921, 4,166; 1931, 3,914.

LOST TEN TRIBES. *See* TRIBES, LOST TEN.

LOT, in Old Testament narrative the nephew of Abraham, and the reputed ancestor of the two Palestinian peoples the Moabites and the Ammonites. Genesis 19:30-38. Separating from Abraham, Lot chose as his domain the valley of the Jordan in which were situated the wicked cities of Sodom and Gomorrah. Lot was providentially saved from the fate of the inhabitants of these cities, but his wife looked back and was changed to a pillar of salt.

LOTHAR II (III) the Saxon (c. 1060-1137), Holy Roman Emperor, the son of the count of Supplinburg. Hence the name by which he is best known. By marriage he greatly increased his estates. In 1106 he became duke of Saxony and thus one of the most powerful nobles in Germany. Having grown up in a time of bitter struggle between the duchy of Saxony and the Emperor Henry IV, he joined the opposition and in 1105 supported Henry's son, the future Henry V, in his rebellion against his father. In 1125 he was elected king and eight years later crowned emperor by the Pope. His election has some significance in that it marks the triumph of the principle of election in the German kingship over that of heredity which had long been gaining ground.

Lothar's reign is characterized by activity in two important directions. He continued the work, upon which he had been engaged as Saxon duke, of extending German power and influence eastward between the Elbe and the Oder rivers, at the expense of the Slavs. His reign also marks the beginning of the struggle between the Guelf and Hohenstaufen parties in Germany. Frederick of Hohenstaufen had been his most active rival for the crown in 1125, but the struggle involved something more than dynastic rivalry; in its broader implications it meant the clash of the principles of states rights against a unified and absolute government. Lothar was a man of great energy and more than average ability. He died at Breitenwaug, Tyrol, in Dec. 1137 while returning from an Italian expedition.

LOTHARIO, the type of the gay libertine. He appears as a gallant young Florentine in Cervantes's *Curious Impertinent,* 1613; and in Rowe's tragedy, *The Fair Penitent,* 1703, he figures as an unscrupulous Genoese noble who seduces the heroine Calista and is killed in a duel. Lovelace, in Richardson's *Clarissa Harlowe,* 1748, is a further development of the character.

LOTI, PIERRE (1850-1923), pen name of Louis Marie Julien Viaud, French writer, who was born at

Rochefort, Jan. 14, 1850. He was a naval officer and his service in foreign waters supplied him with material for books which soon brought him wide celebrity. Half novels, half autobiographies, his dreamy, mournful style and remarkable descriptive powers were well suited to his exotic backgrounds. *Mon Frere Yves, Pecheur d' Islande, Madame Chrysantheme* and *Ramuntcho* are his most popular books. Loti died at Hendaye, June 10, 1923.

LOTTERY, a public or private gambling enterprise which distributes prizes as determined by chance, or lot. The lottery has a recorded history extending back to the Roman emperors, but relics found in Assyrian mounds indicate that the institution was known to ancient man. Public or government lotteries are generally state projects for raising money by the wholesale marketing of numbered tickets, one or more of which are selected to win a cash prize or other reward, worth many times the original cost of the ticket. There is scarcely a government in modern history which has not made use of this means of obtaining funds for public enterprises. In some countries to-day, as in Italy, Spain, Cuba, Turkey and several South American nations, government lotteries are still maintained. The argument raised in support of the practice is that the government has better use for the money thus raised than private or foreign gambling agencies which would otherwise obtain the risked sums.

Lotteries are specifically prohibited by law in the United States, Great Britain and in most European countries, where legislators have agreed that governmental participation in gambling has an adverse effect on public morals, and that the sums raised are of no intrinsic profit to the government, since they do not represent material production. This is, however, a comparatively recent view. France, England and Germany for many years raised sums by exploiting the longing of the poor for sudden riches, and in the early history of the United States the Virginia Co. and other official bodies resorted to lotteries to obtain revenues. It was not until 1890 that the last state lottery in this country was prohibited by law. That year marked the close of the Louisiana State Lottery. The same year Congress passed an act forbidding the transmission of lottery tickets through the mails. Nevertheless illicit lotteries flourish among the poorer classes, who play Policy and other lotteries based on the figures of bank clearings and Stock Exchange sales. The sum thus expended on present-day lotteries is estimated at several millions a year.

Lotteries held in connection with horse-races are popularly called sweepstakes, in which the holder of the ticket representing the winning horse wins all the money, or stakes, laid against the losing field by the "pool" to which he has contributed. As in the case of lotteries, sweepstakes are prohibited in most States.

LOTUS, a name applied since ancient times to various plants. The fruit used by the lotus-eaters, "lotophagi" of Grecian times were borne by a bushy species of jujube (*Zizyphus Lotus*). The Egyptian lotus (*Nymphæa Lotus*), the sacred lotus of the Hindus (*Nelumbium Nelumbo*) and the American lotus (*Nelumbium luteum*), highly prized by the Indians, are water-lilies. The lotus tree, planted for ornament and for shade by the Romans, is believed to be the nettle-tree (*Celtis australis*). In botany, *Lotus* is a numerous genus of herbs and subshrubs of the pea family. It comprises upward of 100 species native to temperate regions, some 30 of which occur in the western United States, chiefly in California. Among those grown for ornament and for food or forage are the winged pea (*L. tetragonolobus*), the birdsfoot trefoil (*L. corniculatus*) and the St. James trefoil (*L. jacobæus*).



EGYPTIAN LOTUS
Nymphæa Lotus

LOTUS-EATERS. In Homer's Odyssey, a people (called the *Lotophagi*) who, eating of the lotus-tree, had forgotten all the world's affairs and activities. *The Lotus-Eaters* is the title of a poem by Tennyson, in which is depicted the dreamy life of an island people who live in idle luxury, completely forgetful of the outside world.

LOTZE, RUDOLF HERMANN (1817-81), German philosopher, was born at Bautzen, May 21, 1817. When 21 he had received the Ph.D. and M.D. degrees from the University of Leipzig. Beginning his academic career at Leipzig in 1843, he went the next year to Göttingen. He remained here until called to the University of Berlin in 1881 shortly before his death. Lotze is best known for his *Microcosmus,* 1856-64. His *Logic,* 1874, and *Metaphysics,* 1879, give a more mature statement of his system. An earlier work on *Medical Psychology* is also worthy of note. Lotze's philosophy is known as realistic idealism. It is an attempt to reconcile science and religion. To be is to be in relation. From this he argues to the Absolute as the ground for all relations. In psychology Lotze is known for his theory of local signs. He died in Berlin, July 1, 1881.

LOUBET, ÉMILE FRANÇOIS (1838-1929), President of France, was born at Marsanne (Drome) Dec. 30, 1838. Admitted to the bar (1862), he practiced law at Montélimar, in his native province, where he became mayor. He was elected to the Chamber of Deputies in 1876 and entered the Senate in 1885. After serving as president of the Senate, in 1899 he was chosen president of France. During his term of office he witnessed the Dreyfus affair, the extension of the Russian alliance in 1899, the separation of Church and State in 1905 and the bitter hostility to England because of the Boer War. An attempt was made on the life of Loubet in 1905. He died on Dec. 20, 1929, at the age of 91.

LOUCHEUR, LOUIS (1872-), French statesman, was born at Roubais, Aug. 12, 1872. Since 1919

member of the Parliament, of the Radical-left party, he was minister of the liberated regions in 1921, concluded with Rathenau the Wiesbaden Convention, and held the portfolios of minister of commerce in 1924 and finance in 1925. One of France's men of big business, Loucheur was the principal figure in the formation of an international steel cartel, which began operating on Oct. 1, 1926.

LOUCHEUX, a name usually applied to include all the Kutchin tribes speaking a single dialect of the northern division of the North American Indian Athapascan linguistic stock, occupying the Yukon and its tributaries above Nuklukayet, the Peel River Basin and the Lower Mackenzie Valley. Specifically, it applies to the TUKKUTCHKUTCHIN. The Loucheux or Kutchin dialect is spoken also by the Tatlitkutchin, Vuntakutchin, Kutchakutchin, Natsitkutchin and Trotsitkutchin.

LOUD SPEAKER, a device for converting electrical to acoustical power at such intensities as to be readily audible at moderate distances. A loud speaker consists essentially of a driving mechanism, whereby motion of mechanical parts is obtained from electrical power, and a diaphragm for setting the air into vibration to produce sound waves. Since a small diaphragm will not work successfully alone, it is usually placed at the small end of a HORN. The area of cross-section of the horn should increase exponentially with the length, instead of conically, so as to minimize the effects of horn RESONANCE at particular frequencies. To give good response at the lower frequencies, a long horn with a large open end is desirable. Horns as long as 14 ft. are in common use in some of the talking moving picture theaters.

A cone speaker employs a diaphragm large enough to perform satisfactorily without a horn. Usually, however, the cone functions best when set in a baffle. To be highly effective at the lower frequencies, the baffle should be three feet, or more, in diameter.

There are two types of electromagnetic driving units in common use. One has a driving coil wound on a permanent MAGNET. This coil is connected in the "output" circuit of the RADIO RECEIVER or TELEPHONE with which the speaker is used so that the fluctuating AUDIO-FREQUENCY currents pass through it. These currents set up a magnetic field which varies in intensity with the current fluctuations, and thus acts to vary the intensity of the composite magnetic field of the coil and magnet. These variations change the force acting on the armature and thus cause it to vibrate, with the diaphragm, to produce the sound waves. The other well known unit, called a dynamic unit, has a driving coil suspended in the field of an electromagnet. The coil is attached directly to the cone or diaphragm of the loud speaker. L. G. H.

LOUIS, name of 18 kings of France. Louis I (778-840), Emperor of the Holy Roman Empire, whose attempts to raise the moral level of his court gained him the name of "the Pious." Louis II, the Stammerer (846-879), son of Charles the Bald, was made king of Aquitania by his father, whom he succeeded in France in 877. Louis III (863-882), eldest son of Louis II, received NEUSTRIA in the division of territory of 881, and died childless in 882. Louis IV, d'Outremer (921-954), so called because he was educated in England, son of Charles the Simple, was made king largely through the support of Hugo, Count of Paris. In an attempt to free himself from interference by this ambitious retainer he was imprisoned by Hugo, but was reinstated in 946 by Emperor OTTO THE GREAT. Louis V, the Lazy (967-987), son of Lothair III, succeeded his father in 986. With him ended the reign of the Carolingians. Louis VI, the Fat (1081-1137), succeeded his father, Philip I, in 1108. He was able and courageous, building a foundation for France by controlling the rebellious nobles in his domain. Louis VII, le Jeune (1120-80), separated from his wife Eleanor, whose subsequent marriage to Henry II of England gave the latter her rich Aquitanian inheritance to the great cost of France. Louis VIII (1187-1226), succeeded to the throne in 1223, and immediately conquered Poitou. He subdued the Albigenses and died near Toulouse. LOUIS IX, Saint Louis (1214-70), led an unsuccessful crusade to Egypt, was captured, and returned after being ransomed. He reestablished the power of the throne by his control of the nobles, and died in Africa while leading a second crusade. Louis X (1289-1316), son of PHILIP IV and Joanna of Navarre, succeeded his mother on the throne as King of Navarre and Count of Champagne in 1305, and in 1314 followed his father on the throne of France. LOUIS XI (1423-83), joined a rebellion against his father and was banished. After his coronation in 1461 he gained large territories by conquest, furthered trade and agriculture, and was an able administrator. LOUIS XII (1462-1515). LOUIS XIII (1601-43). LOUIS XIV (1638-1715). LOUIS XV (1710-74). LOUIS XVI (1754-1793). LOUIS XVII (1785-95). LOUIS XVIII (1755-1824).

LOUIS I, the Pious (778-840), among the French "le Débonnaire," was born at Chasseneuil in 778, the son of Charles the Great. He was crowned king of Aquitania in 781, was an able warrior and a learned man, but lacked stability. He reformed both church and state after he succeeded his father in 814, but his father's advisors were ignored and large grants of land were granted the clergy. His plan to divide the Holy Roman Empire caused protracted warring with his sons, who leagued against him and each other. A broken-hearted man, Louis died in 840 near Ingelheim.

LOUIS IX (1214-70), called St. Louis, king of France, was born at Poissy, France, the son of Louis VIII and Blanche of Castile. He succeeded his father when only 12 years old, but until 1236 ruled under his mother's regency. Rigidly trained by his mother, he was simple and austere in his habits. To many he gave the impression of too great simplicity and piety. It is said that in emulation of monks he wore

a hair shirt under his robes. But he was never subservient.

In fulfillment of a vow made while suffering from a dangerous disease, Louis in 1248 led an army of 50,000 on a crusade against the Saracens. After an auspicious beginning, the expedition met with a disastrous defeat at Mansura, resulting in the capture of the king and the loss of most of his men. Louis paid a huge ransom for his release, then journeyed to Palestine, and in 1254 returned to Paris. In the early part of his reign there was disaffection and rebellion among the nobles. This was put down, however, and Louis was able considerably to extend the royal authority in the lands of his great feudatories. This is notably true in the case of the district of Toulouse, which during his reign was brought directly under the crown. Royal justice was improved and extended; there was extension in the royal coinage, in taxation, and in the military organization. It was a period not so much of conquest as of administrative consolidation. In 1259 Louis concluded an important treaty with HENRY III by which he ceded Guienne and Gascony, retaining, however, feudal suzerainty over these lands. In return the English king agreed to abandon his claim to Normandy, Maine, Anjou, and Touraine. Five years later he acted as arbitrator in a dispute between Henry and the English barons. In 1270 Louis led a second ill-fated crusade against the infidels in which he died of the plague, under the walls of Tunis, Aug. 25, 1270. Pope Boniface VIII canonized him in 1297.

LOUIS XI (1423-83), King of France, was born at Bourges July 3, 1423. He was the son of Charles VII and Mary of Anjou. As dauphin he participated in feudal conspiracies against his father, for which he was banished to his province of Dauphine and ultimately driven to seek refuge in Burgundy. On his coronation in 1461 he was faced with the problem of dealing with an aggressive feudal nobility and a Burgundy dreaming of independence. His weapons were chiefly diplomacy, treachery and bribery. By these means he soon made himself master of the central government. His chief opponent, Duke CHARLES THE BOLD of Burgundy, met his death in a war with the Swiss, leaving a daughter, Mary, as his sole heir. Louis seized the opportunity to annex a considerable portion of the Burgundian inheritance, including the duchy. Further annexations were checked by Mary's marriage to Maximilian, the Habsburg heir. On the death of Louis, Aug. 30, 1483, the royal domain included nearly the whole of the kingdom except Brittany. Louis XI restored the French monarchy and brought French feudalism to an end. W. I. B.

LOUIS XII (1462-1515), King of France, was born June 27, 1462, the son of Charles, Duke of Orleans. In disfavor at the court of Charles VIII, he was imprisoned from 1487-90, but in 1498 at the death of Charles without heirs, Louis came to the throne. By pardoning all subjects who had opposed his succession he started his reign auspiciously. The following year Louis married Anne of Brittany, the widow of Charles VIII. The same year he invaded Milan, his claim to the duchy resting on his descent from Gian Galeazzo, Duke of Milan, and defeated the forces of Ludovico Sforza. In 1500 Louis seized Naples; but in 1511 was driven permanently from Italy. Meanwhile, Henry VIII of England landed in France with a strong army, and in 1513 Louis was vanquished at the Battle of the Spurs. By the terms of ensuing peace, Louis married Mary Tudor, sister of Henry VIII.

LOUIS XIII (1601-43), King of France, son of Henry IV and Marie de Medici, was born at Fontainebleau, France, Sept. 27, 1601. His father was assassinated in 1610 and Louis, too young to rule, ascended the throne with his mother as regent. In 1615 he married Anne of Austria, daughter of Philip III of Spain. The king was easily dominated by others and the first to gain ascendency over him was the Duke of Luynes. Through the latter's machinations, the Queen's crown minister, Concini, was assassinated (April 1617), and Marie de Medici was banished to the castle at Blois. Civil and religious disorders prevailed for eight years, after which time Louis appointed Cardinal Richelieu as prime minister. Richelieu quickly won Louis's confidence and dominated him for the remaining 18 years of his reign. The cardinal determined to break the Huguenot organization, and in 1628 he captured the Protestant stronghold of La Rochelle. Acting through his vigorous prime minister, Louis opposed the Hapsburgs, and during part of the Thirty Years' War subsidized the Swedish forces of Gustavus Adolphus in their campaigns against Austria. Richelieu's power over the king was common knowledge, and in 1632 Gaston of Orleans, the king's brother, headed a Spanish army whose aim was to overthrow the Cardinal. That effort as well as a second uprising against him in 1641, failed. Louis died at St. Germain en-Laye, May 14, 1643, and was succeeded by his son, Louis XIV.

LOUIS XIV (1638-1715), King of France (1643-1715). Twenty-three years after their marriage there was born to Louis XIII, King of France, and his queen, Anne of Austria, on Sept. 5, 1638, a son who was to become Louis XIV. One of his earliest memories must have been his mother's coming to him from the deathbed of her husband to greet him as her son and as her king, for at the time, May 14, 1643, he was but five years old.

In his childhood he did not show himself apt at studies. In fact, Saint-Simon was later to praise his intelligence faintly by calling it "better than mediocre." He grew nonetheless to be a personable young man, handsome, though short, suave, polite, conscientious, hard-working and so convinced of his own dignity and importance that no one else ever doubted it for a minute. As a youth he evinced much interest in war and military matters to which he soon added a close attention to diplomacy. He was not very religious in his early days, and from the time he reached manhood he was more than susceptible to the fair sex. Until Louis XIV attained the age of 22, the country was under the control

of Cardinal Mazarin. Though twice driven out of Paris by the insurrections of the Fronde, the cardinal brought to France peace at home and glory abroad before his death. One of his last major moves in diplomacy was to arrange the marriage of Louis to Maria Theresa, daughter of the King of Spain.

In March, 1661, Mazarin died. The courtiers speculated as to his successor, but soon found that the king intended to be his own minister. During his reign, Louis had many able servants: Colbert, in every department but war; Louvois, in charge of military affairs; Vauban, the great army engineer; and Condé and Turenne, brilliant generals. But he himself dominated the administration. No minister rose to be a RICHELIEU, for all of them knew that they were utterly dependent upon the will of the king. From the time he took control of the government in 1661 till the end of his reign, Louis epitomized the absolute monarch, ruling by divine right. He may not have said, "I am the state," but he acted on that premise. His responsibilities, however, he took seriously. Morning and afternoon he worked hard on papers, edicts, council meetings and the like. For half a century he spent a large part of almost every day in toilsome administrative labor. "One reigns by work and for work," he wrote his grandson.

That which was most precious to Louis was his glory. Through Colbert, he pensioned writers, poets, dramatists and scientists who were to glorify him. His reign was adorned by such literary figures as Corneille, Moliere, La Fontaine, Racine and Madame de Sevigne. Bossuet, Bishop of Meaux, preached eloquent sermons on monarchs as the vice-regents of God. As a symbol of his glory, at an expense that made Colbert groan, Louis built his great pleasure-palace of Versailles where the nobles flocked "to shine in the brilliance shed by the Sun-King, the Grand Monarque," and to take part in the etiquette-ridden functions with which he hedged his majesty. So effectively did Louis play the rôle of king that every petty potentate of Europe aped his ways and sought to build some miniature Versailles.

To Louis, the search for glory demanded military conquests that would give to France her "natural boundaries," the Rhine, the Alps, the Pyrenees and the sea. Colbert attempted to interest him in the "peaceful victories" of commerce, but to no avail. Beginning with the War of Devolution (1667-68) Louis plunged France successively into the Dutch War (1672-78), the War of the League of Augsburg (1689-97) and the War of the Spanish Succession (1701-13). Thus, France was at war for 28 out of the last 48 years of Louis's reign. At first, the military efforts of the French were crowned with success. But the last two wars were disastrous. If Louis, before he died, had the pleasure of seeing his grandson, Philip of Anjou, firmly seated on the throne of Spain, he must have had at the same time the realization that the wars had cost a vast number of lives, and enormous sums of money as well as a large number of colonies.

Besides his costly wars, the latter part of Louis's reign was marred by what was probably a mistaken policy in regard to the Huguenots. As he became older, Louis grew more religious. Turning his attention to the Protestants who were living in France and enjoying the religious freedom granted by the Edict of Nantes (1598), Louis decided to make them conform to Catholicism. Accordingly, he harassed them, at first, by such devices as quartering licentious dragoons upon them. Then he went the whole way and revoked the Edict of Nantes (1685), thus driving from the country thousands of Protestants.

The personal life of Louis XIV was almost lost in his public duties, save for his amours. His wife Maria Theresa was short, fat and unattractive. Almost from the day of their marriage he was unfaithful to her, taking as a mistress, among others, Mademoiselle de la Vallière, then Madame de Montespan, then Mademoiselle de Fontanges. His last mistress, Madame de Maintenon exercised over him such an influence toward piety and religion that he became for a while devoted to his wife. When she died, he secretly married Madame de Maintenon, who kept his affection till the end of his life.

At his death, Sept. 1, 1715, Louis was 77 years old. For 72 years he had been king. To France and to Europe he had been the personification of divine right, absolute monarchy. To France he had brought much glory and some territory, but at such a cost that it is not to be wondered at that drunken revellers cursed his corpse as it was borne slowly to its last resting place at St. Denis. C. W. C.

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LOUIS XV (1710-1774), King of France, was born at Versailles, Feb. 15, 1710. He succeeded his great-grandfather, Louis XIV, to the throne in 1715, with his uncle, the Duke of Orléans, as regent. After the latter's death in 1723, the Duke of Bourbon was chief minister until 1726 and Cardinal Fleury from 1726-1743. In 1725 an agreement was made for the marriage of Louis to Marie, daughter of Stanislas, exiled king of Poland. Louis never took great interest in government, giving most of his time entirely to his pleasures. Following Fleury's death in 1743, the king's mistress, Madame de Pompadour, and afterward her successor, Madame du Barry, were the chief influences in the government.

During this reign France participated in two wars in which fighting occurred in America and Asia as well as Europe: the War of the Austrian Succession, 1741-1748; and the Seven Years' War, 1756-1763. France's part was inglorious and by the Treaty of Paris, 1763, nearly all her possessions in the New World and India were lost.

The reign of Louis XV was a time of decline of

French culture. The grandeur of the court of Louis XIV lessened into frivolity and shameless immorality. Governmental administration was bad, industry and agriculture declined and the mass of the people was increasingly miserable. Altogether indifferent to the situation Louis XV continued his careless mode of life cynically remarking "after us, the deluge." Louis XV died at Versailles May 10, 1774.

LOUIS XVI (1754-93), King of France, was born at Versailles, Aug. 23, 1754, son of Louis XV. After the death of his father and brothers, he became, in 1765, heir to the throne. In youth he showed manliness and intelligence, but he was totally unfitted to rule amid the turbulent years just before the revolution and those tragic two years from the meeting of the Estates General to the overthrow of the monarchy, Aug. 10, 1792.

In 1770 Louis was married to Marie Antoinette, daughter of Maria Theresa, empress of Austria, and 4 years later, at the age of 20, ascended the throne. His first acts met with popular approval. He dismissed the more reactionary of the ministers, appointed Turgot, the great reformer from Limousin, as comptroller of finance. He inaugurated many reforms but the opposition of the privileged classes and the court was too strong, and Louis dismissed Turgot, appointing in his place Necker, a banker who attempted in vain to restore order in the national finances. Conditions became steadily worse and men began to demand the Estates General; Louis consented and issued the call for its election.

On May 5, 1789 the 1,200 deputies assembled at Versailles. A bitter quarrel at once developed between the representatives of the Third Estate and those of the clergy and the nobility. After six weeks the king weakly yielded to the Third Estate. But unfortunately he again yielded to the reactionary clamor of the court and called in troops with the idea of suppressing the assembly. This led to the uprising in Paris, the attack on the Bastille on July 14, the march of the mob to Versailles on Oct. 5 and the return to the city on the following day with the king and queen. From this time on, Louis was no longer free. The assembly also came to Paris and during the next two years carried through the great reforms of the Revolution. But again the king did not give his whole-hearted cooperation and in 1791 he tried to escape to the Austrian Netherlands. Caught and brought back in the face of a sullen and threatening populace, he was for a time suspended.

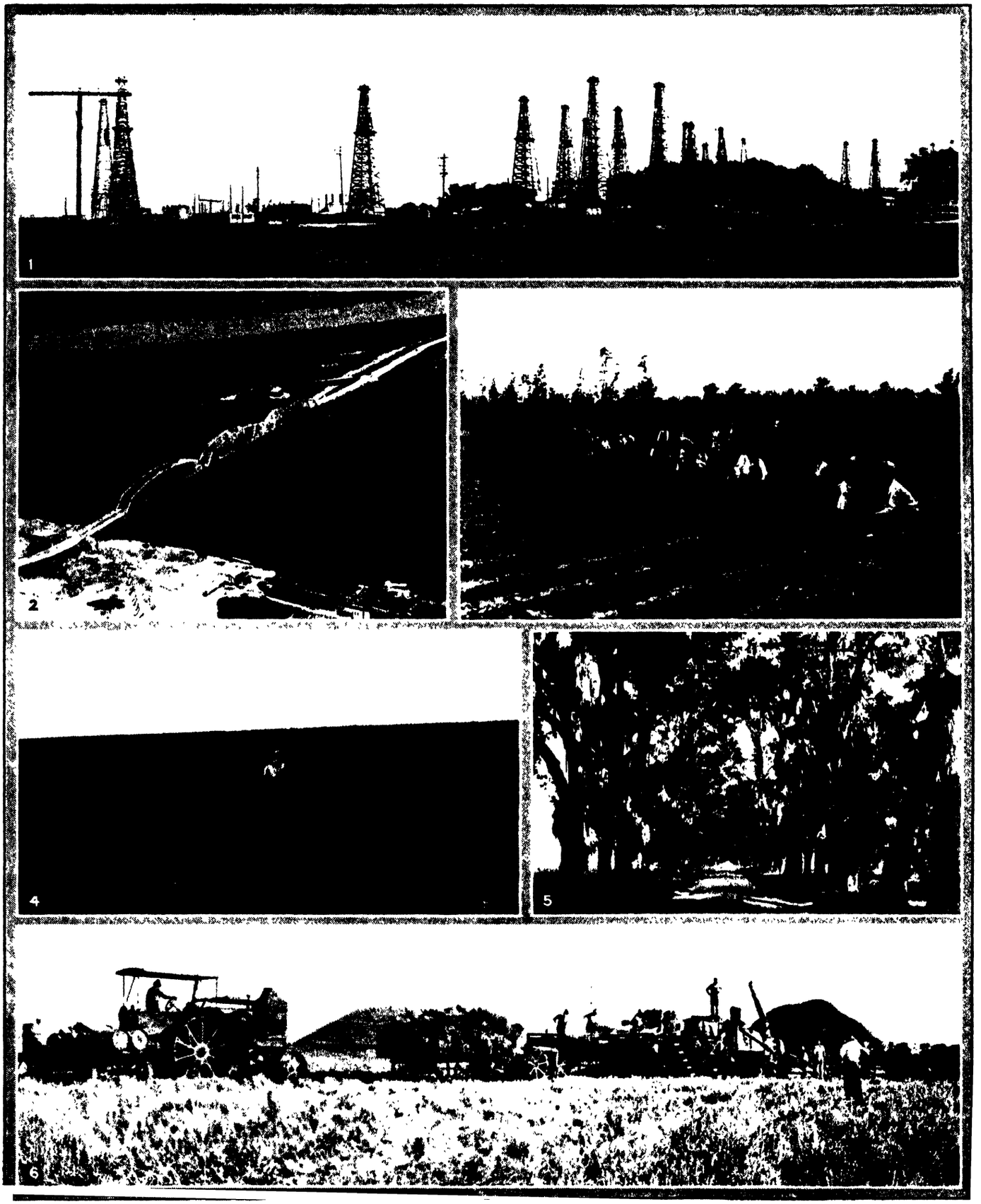
In the meantime, the constitution was completed. Louis, restored to power, signed it and swore to abide by its provisions and to put it into execution. This done the great constituent assembly passed out of existence in Sept. 1791, leaving to the king the task of carrying on the government with the cooperation of a newly elected legislature. For another year Louis, now greatly limited in power by the constitution, continued to reign, but the legislative assembly was hostile from the outset. Besides he carried on intrigues with the rulers of Austria and Prussia, urging them to intervene. Nevertheless, he yielded to the demands of the assembly and declared war in Apr. 1792.

Suspicious of the king's loyalty and angered by the threats of invasion the populace of Paris, aided by volunteers from the provinces, attacked the Tuileries Palace and sacked it on Aug. 10. The king escaped to the Assembly which suspended him and handed him to the government of the city of Paris, which kept him and the royal family imprisoned till the next assembly. The convention, after proclaiming the republic, declared Louis XVI guilty of treason and ordered his execution. Accordingly on Jan. 21, 1793, this weak but well-intentioned monarch was guillotined.

LOUIS XVII (1785-?95), nominal King of France, was born at Versailles, Mar. 17, 1785, the son of Louis XVI and Marie Antoinette. When his father was executed in 1793 Louis became king in name, but was kept a close prisoner. He is believed to have died in June 1795, although some maintain that a child was substituted for him and that Louis escaped and later died obscurely. Many impostors claimed to be the king, chief of whom was a Karl Naundorff who gave a fairly convincing account in support of his contention.

LOUIS XVIII (1755-1824), King of France, was born at Versailles, Nov. 17, 1755, third son of the dauphin Louis and Maria Josepha of Saxony, and younger brother of Louis XVI. He bore the title Count of Provence. In youth he is said to have showed sympathy for Voltaire and the ideas of the Encyclopædists but later became a determined reactionary. The count remained in Paris after the storming of the Bastille in 1789 but fled in 1791, to join the *émigrés nobles* and establish a court at Coblenz as regent of France, declaring the king a prisoner and denouncing the revolutionists. After the execution of Louis XVI in 1793, he pronounced himself regent to his nephew, the little Louis XVII, and when the latter died in 1795, he declared himself king. Unable to return to France, he began his long series of visits to European courts, finally settling at London in 1807.

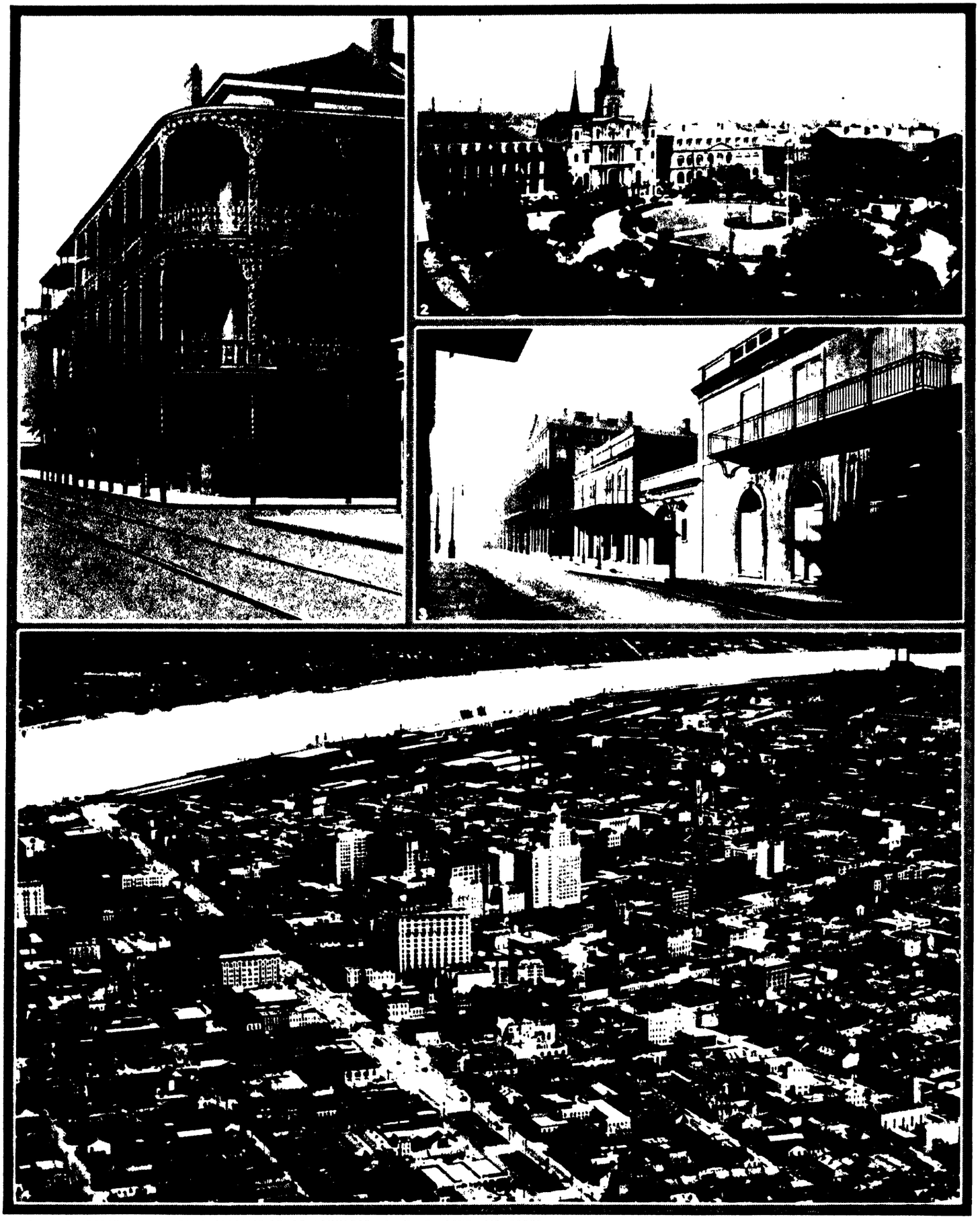
Louis remained in England until the fall of Napoleon, when he returned to Paris on May 3, 1814, to ascend the throne as Louis XVIII. He issued a charter or constitution which was really quite liberal but the Bourbon restoration was not popular. Severe reaction led by the king's brother set in and there was much discontent when Napoleon escaped from Elba and returned to Paris in 1815. After Waterloo, Louis returned, as the wits said, "in the baggage of the Allies," to ascend the throne once more. Determined not to lose it again he shrewdly adopted a policy of moderation, a middle course, as he called it, between the extreme reactionists among his friends of the old régime and those more in sympathy with the Revolution. In this he was successful, but the assassination of his nephew the Duc de Berry upon whom the Bourbon succession depended, and the



4, COURTESY LAKE CHARLES C. OF C.; 2, 5, LA. HIGHWAY COMM.; 3, LOUISIANA C. O C.; 6, ADVANCE RUMLLY THRESHER CO.

VARIED SCENES IN THE COUNTRYSIDE OF LOUISIANA

1. Oil fields near Lake Charles. **2.** The Chef Menteur Bridge which with the Rigolets Bridge forms an important link in the Old Spanish Trail; eastern outlet for New Orleans. **3.** Strawberry pickers in a field near Hammond in Tangipahoa Parish. **4.** Rice fields near Lake Charles. **5.** "Pine Alley," famous mile-long avenue of pines and live oaks planted by slaves a hundred years ago on a plantation near St. Martinville. Spanish moss hangs from the boughs in graceful festoons. **6.** Threshing rice on a Louisiana plantation.



1, 2, 3, COURTESY NEW ORLEANS ASSOCIATION OF COMMERCE; 4, U. S. ARMY AIR CORPS

CHARACTERISTIC VIEWS OF NEW ORLEANS—OLD AND NEW

1. House in Vieux Carré with lace-like iron work. **2.** Heart of old New Orleans. Jackson Square with Cabildo, St. Louis Cathedral and Pontalba Apartments. **3.** The Little Theater, St. Peter Street, in the Vieux Carré. **4.** Canal Street, starting from the Mississippi River, separates the French quarter from the modern business district.

election of radicals to the assembly, notably the Abbé Gregoire, who was supposed to have voted for the death of Louis XVI in 1793, frightened him.

During the remaining four years of his reign, Louis yielded to the reactionary influences about him despite his appreciation of the fact that the forces of liberalism must be conciliated, for on his death bed he urged his brother, later Charles X, to be moderate and so preserve the throne for his grandson. Louis died at Paris, Sept. 16, 1824.

LOUIS IV (c. 1287-1347), called Louis the Bavarian, German King and Duke of Upper Bavaria, was born about 1287. Louis was the second son of Louis II, Duke of Upper Bavaria and Count Palatine of the Rhine, who died in 1294, and inherited half of his father's possessions. The double election to the throne of Germany of Louis and the Austrian prince Frederick in 1314 kept Louis engaged for eight years in civil strife, decided in 1322 by the important Battle of Muhldorf in his favor. Having emerged the technical victor in the dispute engendered by the conflict within the German Electoral College, Louis now met a new opponent in Pope John XXII, who excommunicated and deposed him and schemed to offer the imperial title to Charles IV of France. Louis descended on Italy in 1327, had himself crowned Emperor by the "people of Rome," declared the unfriendly Pope, in Avignon, deposed, and set up a weak rival who deserted him as soon as he had left Italy. In 1338 the Diet of Frankfort, summoned by Louis, issued the decree *Licet Juris,* in which the independence of imperial power from papal domination is categorically maintained. Louis was for a long time the center of opposition to the papacy. It was under his protection that Marsilius of Padua wrote the *Defensor Pacis,* attacking the very basis of papal power. But Louis succeeded in making himself unpopular with some of the princely electors who with the connivance of Pope Clement VI put forward Charles IV of Bohemia in 1346 as his rival. Civil war threatened, and was averted only by the sudden death of Louis in Oct. 1347.

LOUIS PHILIPPE (1773-1850), King of France, 1830-48, was born in Paris, Oct. 6, 1773. He was the eldest son of Philippe, Duke of Orleans, but in 1792 relinquished his titles to adopt the surname Égalité. Louis favored the Revolution but became involved in a conspiracy and in April 1793 was forced to flee to Austria. After the Restoration (1814) he returned to France and, on the deposition of Charles X by the July Revolution (1830), Louis Philippe was crowned king Aug. 9, 1830, largely through the influence of the banker, Laffitte. He was called the "Citizen-King" and constantly sought to gain the favor of the "bourgeoisie" or middle classes. Though bourgeois in all his sympathies he had no appreciation of the demands of the Liberals or the needs of the masses whose condition during the early development of the Industrial Revolution in France was growing steadily worse. Like his prime minister Guizot, he resolutely resisted all demands for reform from 1840 to 1848, when the revolution broke out in February and he was driven from the throne into exile. He died in Claremont, England, Aug. 26, 1850.

LOUIS D'OR, a gold coin with milled edges issued in France from 1640 to 1810, worth about $4.00.

LOUISE (AUGUSTE WILHELMINE AMALIE LUISE) (1776-1810), Queen of Prussia and daughter of Prince Charles of Mecklenburg-Strelitz, was born in Hanover, Mar. 10, 1776. On Dec. 4, 1793 she married the crown prince of Prussia who in 1797 became King Frederick William III. She was an exceedingly popular queen, famous for her beauty and loved and revered for her patriotism, courage and gracious dignity, and particularly for her conduct during the Napoleonic wars. Before the Peace of Tilsit when Prussia was at the mercy of France following the defeats of Jena and Friedland, Louise journeyed to Napoleon's headquarters and made a personal appeal for Prussia, which, however, proved to be in vain. Napoleon later tried to destroy her reputation, but his slanders only endeared her the more to the Prussian people. The Order of Louise was established in her honor in 1814 by Frederick William III. She died at Strelitz, July 19, 1810.

LOUISE, an opera in four acts by GUSTAVE CHARPENTIER, libretto by the composer; première, Paris, 1900. It is the only successful opera by the composer.

Louise, in love with an artist, Julien, is censured by her working-class family for associating with a man of Bohemian habits. Torn between romance and her duty to her family, she eventually joins fortunes with Julien. Remorseful over the grief she has caused her parents, she returns home and is forgiven; but romance at length proves too powerful, and she goes back to Paris and her lover.

LOUISE, LAKE, an alpine lake in Banff Park, western Alberta, Canada, 1½ mi. long and ¾ of a mi. wide. It lies in a cirque at the base of Mt. Victoria at an altitude of 5,670 ft. above sea level and is surrounded by lofty peaks including Mts. Lefroy, Saddleback, Fairview, Devil's Thumb and others. The waters of the lake are famous for their tints of blue and green which constantly change as they mirror the forest and glacier-clad peaks. Lake Louise is a favorite resort and is a center for mountain climbing and motor trips. It is reached from the Canadian Pacific Railway and by the Banff-Windermere Highway.



LOUISIANA STATE SEAL

LOUISIANA, one of the Gulf states of the United States, popularly called the "Creole State." It is situated between 29° and 33° N. lat. and 89° and 94° W. long. On the north it is bounded by Arkansas and Mississippi; on the east by Mississippi, from which it is separated by the Mississippi River, and the

Gulf of Mexico; on the south by the Gulf and on the west by Texas, from which it is separated in large part by the Sabine River. Louisiana comprises an area of 48,506 sq. mi., of which 3,097 sq. mi. are water surface. In size Louisiana ranks thirtieth among the states of the Union.

Surface Features. Louisiana lies entirely within the low Gulf Coastal Plain. A north and south line of blunt sandstone hills hems in the eastern one-third of the state which comprises the flood plain of the Mississippi River. Within this plain are the basins of the Tensas, Red and Atchafalaya rivers and the great delta.

The western two-thirds of the state is cut into two parts by the slantwise course of the Red River. North of the stream is a low plateau, and south of it wide grassy plains extending from beyond the Texas boundary. A wide belt of marshes borders the Gulf coast. As a whole the state has a mean elevation of 100 ft. above sea level. The maximum altitude occurs in Claiborne County on the northern boundary.

Along the courses of the RED and MISSISSIPPI rivers are numerous horseshoe lakes originating from cut-off curves of the streams. The large lakes found near the coast, such as Sabine, Borgne and PONTCHARTRAIN, are mostly coast lagoons or landlocked salt water bays. Below the mouth of the Red River the Mississippi flood plain is laced with bayous which serve as secondary outlets for the main streams.

Climate. By reason of its proximity to the Gulf of Mexico, the climate of Louisiana is generally quite warm and not variable. The mean annual temperature for the state is 67.2° F., ranging from 69.3° F. in the Mississippi Delta to 65.8° F. at Shreveport in the northwestern part of the state. The average temperature in the Mississippi Delta is 54.2° F. for January and 82.4° F. for July, at Shreveport 47° F. for January and 83.2° F. for July. During the period, 1891-1930, the highest temperature recorded in Louisiana was 111° F. and the lowest —16° F. The average annual rainfall is 55.3 in., varying from 57.5 in. at New Orleans to 43.4 in. at Shreveport. On the average rain falls on about 100 days of the year. At New Orleans the growing season is about 325 days; at Shreveport, 249 days.

Forests and Parks. When white men first arrived the 29,061,760 acres which became the state of Louisiana were covered with a practically unbroken forest of cypress, pine and hardwoods. Long- and short-leaf pine and mixed hardwoods, principally oaks, hickory and red gum, are found on the uplands; on the alluvial bottom lands which cover one-half the state is a luxuriant growth of hardwoods including several kinds of oaks, gums, elm, ash, magnolia, cottonwood, sycamore and willow. The forest area, according to a 1929 estimate, covers 16,000,000 acres of which about 2,000,000 acres is virgin timber. A state forest with an area of 5,900 acres has been set aside in Rapides Parish and is developed for camping and other recreational activities. Intensive reforestation programs have been inaugurated through the Federal Government forest service which maintains a permanent experimental station at Southern and branch stations at Urania and Bogalusa. Five game preserves with a total area of 282,000 acres have been established for the protection of fur-bearing animals such as muskrat, opossum, raccoon, mink, wolf, fox, weasel and beaver. A part of Bayou Teche, 100 mi. north of New Orleans, where Evangeline met Gabriel as told in Longfellow's *Evangeline,* has been made into an historical park occupying approximately 150 acres. A national monument commemorating the Battle of New Orleans is located at CHALMETTE.

Minerals and Mining. From 1904 until 1924, when the beds in Calcasieu Parish were exhausted, Louisiana usually led the world in sulphur production. Petroleum production, which began immediately after the discovery of the oil fields at Beaumont, Tex., rose to 12,000,000 bbls. in 1913.

With mineral productions for 1929 amounting to $62,725,997 Louisiana stood twentieth among the states, ranking fifth in salt, sixth in petroleum, and fourth in the quantity of natural gas produced. The outstanding products were natural gas, 261,138,000 M. cu. ft., valued at $26,505,000; petroleum, 20,554,000 bbls., $25,700,000; and natural gasoline, 64,957,000 gals., $4,010,000. The most important minor products were salt, 525,840 tons, $2,277,366, and sand and gravel, 3,138,673 tons, $2,069,024.

Soil. Lower Louisiana consists entirely of alluvial deposits from the Mississippi and Red rivers. Some of the soil is newly deposited, but much is "bluff" land or well-drained alluvium. This section of Louisiana is noted for the production of sugar-cane, Indian corn and cotton. The northwestern part of the state is prairie land comprised of a gray silty loam overlying much yellow marl and, with irrigation, is well adapted to the raising of rice. Northern, northwestern and eastern Louisiana soils consist chiefly of sandy or sandy loams with only a little clay and often with deposits of marl.

Agriculture. The chief crops produced are cotton, corn, rice, vegetables, sugar cane and fruits. In 1930 9,355,437 ac. or 32.2% of the entire land area was in farms, 161,445 in number, with an average size per farm of 57.9 ac. and an average value per acre of $44.70. Of the farm area 4,740,395 ac. was crop land; 2,234,687 ac., pasture land; and 1,741,975 ac., woodland. The total value of farm property was $501,825,735, of which $418,191,773 was represented by land and buildings; $28,173,647, by implements and machinery; and $55,460,315, by domestic animals.

According to the census of 1930 Louisiana produced in 1929 field crops to the value of $149,750,498, ranking twenty-sixth among the states. It stood first in rice, sixth in beans, eighth in cotton, seventh in cottonseed, and eighth in sweet potatoes; it also ranked third in strawberries and figs and sixth in pecans. The chief crop was cotton, 798,828 bales grown on 1,945,354 ac. and valued at $66,302,724, together with cottonseed, 385,476 tons, $11,949,756. Other important crops were: grains, $34,424,186,

chiefly corn 18,279,702 bu. and rice 16,317,463 bu.; vegetables, $15,734,113; sugar cane for sugar, approximately $11,000,000; fruits and nuts, $5,416,690, and hay, 216,217 tons, $3,652,358. Among the vegetables were sweet potatoes, $4,210,167; potatoes, $2,144,502, and beans $801,685. The yield of sugar cane for sugar was 2,992,127 tons, and for sirup, 1,736,907 gals. The leading fruit and nut crops were peaches 194,635 bu., oranges 82,500 boxes, strawberries 24,128,694 qts., figs 1,598,314 lbs. and pecans 1,303,148 lbs.

Farm products sold by cooperative marketing fell from $9,715,844 in 1919 to $7,075,237 in 1929. Farm machinery and equipment in 1930 included 43,082 automobiles, 9,281 motor trucks, 5,016 tractors, 633 electric motors and 2,639 stationary gas engines.

Irrigation. In several southwestern counties irrigation was established between 1890 and 1900 chiefly for the cultivation of rice. According to the Census of 1930 irrigation was more or less utilized in 21 parishes, which are separately reported. It is most extensively developed in Acadia, Calcasieu, Jefferson Davis and Vermilion parishes, which together contain 65% of the irrigated farms and 80% of the irrigated acreage, and in 1929 produced 88% of the rice crop of the state.

The total number of irrigated farms was 5,588, with an aggregate area of 892,604 ac., of which 450,901 ac. were irrigated. Including land and buildings the value of all irrigated farms was $45,496,283 or an average of $50.97 per ac. The total investment in irrigating enterprises to 1930 was $15,744,743, and the average cost of maintenance and operation in 1929 was $4.09 per ac.

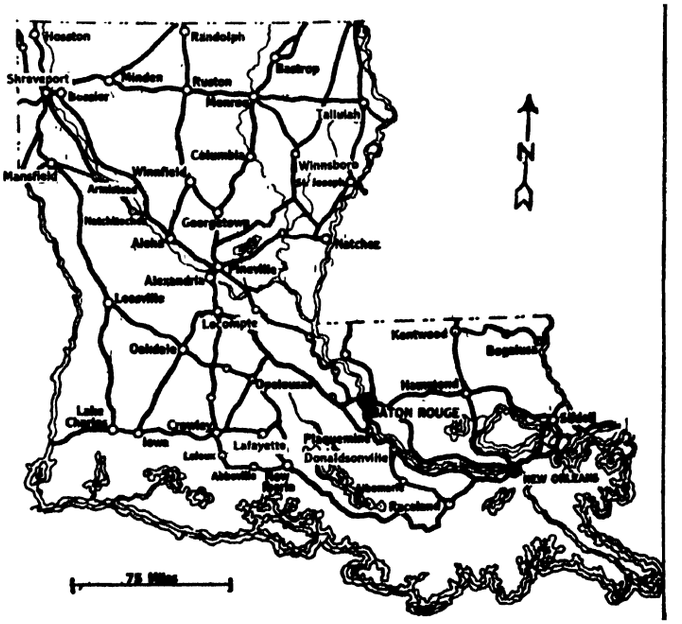
Animal Industry. Cattle- and mule-raising are the chief livestock interests. According to the census of 1930 Louisiana ranked thirty-third among the states in total value, $55,460,315, of domestic animals on farms. Among these were cattle, 729,690 valued at $23,834,539; mules, 200,954, $15,450,755; horses, 118,440, $6,242,882; swine, 759,412, $6,103,686; sheep, 171,432, $662,635; goats, 54,321, $77,582, and asses and burros, 566, $21,830.

Of the cows on farms, 256,059 were kept mainly for milk production and 166,129 mainly for beef production. In 1929, 58,289,639 gals. of milk were produced; the total value of dairy products sold was $5,411,863. The value of all poultry raised, chiefly chickens, was $5,589,328; the chickens sold were valued at $1,209,036. Of 22,461,672 doz. chicken eggs produced, valued at $6,272,047, 9,822,858 doz., with a value of $2,720,172, were marketed. Honey, amounting to 562,788 lbs. valued at $71,123, was produced from 32,267 hives.

Fisheries. Louisiana ranked twelfth of the states in the value of its fisheries in 1930, the total catch amounting to 73,714,000 lbs., valued at $3,362,000. There are two distinct commercial fisheries, the marine and the Mississippi River. The marine catch was 61,920,000 lbs., worth $2,765,000; that of the Mississippi River, 11,794,000 lbs., valued at $597,000. Louisiana's oyster take is the most valuable south of Virginia and the shrimp catch the largest in the country. Other principal catches include crabs, croaker, grouper, mullet, snapper, channel bass and menhaden and sea trout, and from fresh water, catfish, buffalo fish, carp and paddlefish. In 1930, 30,000 fishing licenses were issued and $30,341 received in fees. There are three state hatcheries, on which $5,520 was spent during the year. The output was 479,301 bass and other game fish.

Transportation. One of the finest and longest systems of inland waterways in the United States is now operated in Louisiana. The Mississippi River, the industrial canal connecting Lake Pontchartrain with the Mississippi at New Orleans, and many other systems of improved canals, bayous, and lakes provide a total navigable length of about 1,800 mi. of inland waterways. This fine waterway system has been instrumental in keeping railroad rates somewhat lower here than in the surrounding states. The volume of traffic on the Mississippi River between New Orleans and Vicksburg is extremely heavy. The principal ports, in addition to New Orleans, are Baton Rouge, Avondale and Saint Rose. In 1930 aggregate steam railway mileage was 4,763, with the Southern Pacific, Texas & Pacific, Kansas City Southern, Illinois Central and Rock Island the most important systems. The highways were considerably damaged by the floods of 1927, but the state is improving them as fast as its finances will permit.

On Jan. 1, 1930, there were 46,705 mi. of highways in the state, including 11,152 mi. of surfaced roads and 6,598 mi. of state highways. The total



LOUISIANA STATE ROADS

highway expenditure during 1929 was $25,997,006, of which $16,997,006 was paid by the state and $9,000,000 by county and local governments. The state gasoline tax produced a gross revenue of $7,546,448 in 1930. Motor vehicle registrations in 1930 were 275,283, compared with 207,000 in 1925. The growth

of trucking facilities is indicated by the increase in motor truck registrations from 31,000 in 1925 to 44,697 in 1930. During the same period the number of buses in operation increased from 2,040 to 2,665.

Manufactures. The basic manufactures of the state have been developed by utilizing the products of its forests, farms and oil fields.

According to the Census of 1930 Louisiana with manufactures for 1929 valued at $685,036,857 stood twenty-third among the states. Its 1,989 establishments gave employment to 10,206 officers and employees, who received $24,092,926 in salaries and to 87,345 wage earners, who were paid $83,867,448 in wages. These factories used a total of 480,404 horse power, expended $16,221,908 for fuel and power, and $422,318,186 for materials and supplies, and added by the process of manufacture $246,496,763 to the value of their output.

In this output there are 73 separately enumerated groups of products. The state stood first in the cleaning and polishing of rice, fourth in lumber, fifth in cottonseed oil, sixth in petroleum refining and wood preserving and ninth in wood pulp. The major industries, with the value of their products, were petroleum refining, $151,966,142; lumber milling, $78,752,821, and cane sugar refining, $74,706,373. Among other manufactured products were polished rice, valued at $21,589,613; cottonseed oil, cake and meal, $21,296,279; cane sugar and syrup, $18,325,792; paper, $18,058,539; industrial ethyl alcohol, $13,592,515; and bread and bakery products, $13,489,311.

The chief manufacturing districts, separately reported, with the value of their output, were New Orleans, $148,367,650; East Baton Rouge Parish, including Baton Rouge, $102,424,633; Jefferson Parish, $64,482,117, and Shreveport, $21,995,242, or including all of Caddo Parish, $49,188,936.

Commerce. According to the census of 1930, there were in 1929 1,729 wholesaling establishments in Louisiana, with total sales of $819,797,033. These organizations gave full-time employment to 17,493 men and women whose annual salaries aggregated $29,336,618. The chief wholesaling center is New Orleans, with Shreveport also important.

The toal sales of the 23,405 retail stores amounted to $470,018,825. Sales per store averaged $20,082; sales per capita were $223.65.

CHIEF RETAIL DISTRIBUTING GROUPS

Group	*No. of Stores*	*Sales*	*% of Total*
General Mdse.	3,892	$130,447,297	27.75
Automotive	3,050	91,790,525	19.52
Food	9,291	86,394,151	18.38
Apparel	923	36,993,930	7.87
Lumber & Bldg.	510	26,861,366	5.71
Furn. & Household	386	20,076,379	4.26
All other stores	5,353	77,455,177	16.51
Total, all stores	23,405	$470,018,825	100.00

New Orleans, the principal port, handled waterborne traffic amounting to 15,995,374 tons, with a value of $908,536,416. Cotton, sugar, molasses, oil, gasoline, bananas, aluminum and corn were the largest items.

Finance and Banking. The assessed value of all taxable property in 1928 was $2,733,552,714. The total bonded debt in 1930 was $80,406,166. It included $41,026,000 Port Commission debt, $12,007,480 direct obligations and $22,700,000 highway commission debt. Total revenues in 1928 were $28,232,670. The chief sources of revenue were property and special taxes, $10,106,340, and licenses, $11,913,060. This included insurance and corporation franchise taxes and motor vehicle taxes and also gasoline taxes of $3,277,805. Total expenditures were $28,913,520, with the largest items highway, $10,771,509; educational aid, $5,494,571 and permanent improvements and operation of general departments.

There were 269 banks in Louisiana in 1930. Of these, 38 were national banks and 231 trust companies and state banks. Their total capitalization was $38,992,500; their surplus and undivided profits, $28,989,000. Total resources were $527,051,000, with loans and discounts aggregating $318,265,000. Demand and time deposits amounted to $374,483,000. Per capita demand and time deposits were $178.16; per capita savings deposits, $68.37. The total savings of $143,715,000 were owned by 214,967 depositors. National bank circulation aggregated $6,110,000.

Government. The legislative power of Louisiana is vested in a general assembly consisting of a senate composed of 39 members and a house of representatives of 100 members, all elected for terms of four years. The assembly meets in biennial sessions limited in duration to 60 days. A governor, lieutenant governor, auditor, treasurer and secretary of state constitute the executive department. The governor is elected for a term of four years, but is incligible for re-election. He receives a salary of $7,500 per year. Judicial power is vested in the supreme court, courts of appeal, district courts and justices of the peace. The supreme court consists of seven judges elected for terms of 14 years with salaries of $8,000 per annum.

Social Welfare Institutions. At Baton Rouge are schools for the blind and deaf, at Pineville and Jackson hospitals for the insane and at Shreveport a state charity hospital. The Charity Hospital of Louisiana, the Richard Milliken Memorial Hospital, the Delgado Memorial Hospital and a soldiers' home are in New Orleans. A training school for men is located at Monroe. The penitentiary is at Baton Rouge.

Education. The first school, a charity hospital school for girls, was established by the Ursuline nuns at New Orleans in 1727. A Capuchin school for boys was opened there about the same time. After the Spanish took possession of the country in 1761, Spanish schools were conducted for a time but the French schools were more successful. The first free school law was passed in 1806. Separate schools were established for Negroes in 1887. In 1928-29, there were 1,486 public elementary schools for white children with 226,857 pupils and 9,065 teachers; and

1,575 elementary schools for Negroes with 147,579 pupils and 2,894 teachers. The 411 public high schools for white pupils had 2,202 teachers and 49,437 pupils. There were eight Negro high schools with 82 teachers and 6,082 pupils. Children from 7 to 14 years of age are required by law to attend school the full term.

The number of persons from 5 to 20 years attending school in 1930 was 465,064, or 63.2% of the population within the ages specified, as compared to 352,694, or 53%, in 1920. Persons 10 years and over unable to read and write in 1930 numbered 219,750, an illiteracy percentage of 13.5, as compared to 299,092 illiterates, or 21.9%, in 1920. Negro illiterates in 1930 numbered 139,393, or 23.3%, a large decrease from 206,730, or 38.5%, in 1920. Native white illiterates numbered 71,903, or 7.3%, in 1930; and 81,957, or 10.5%, in 1920.

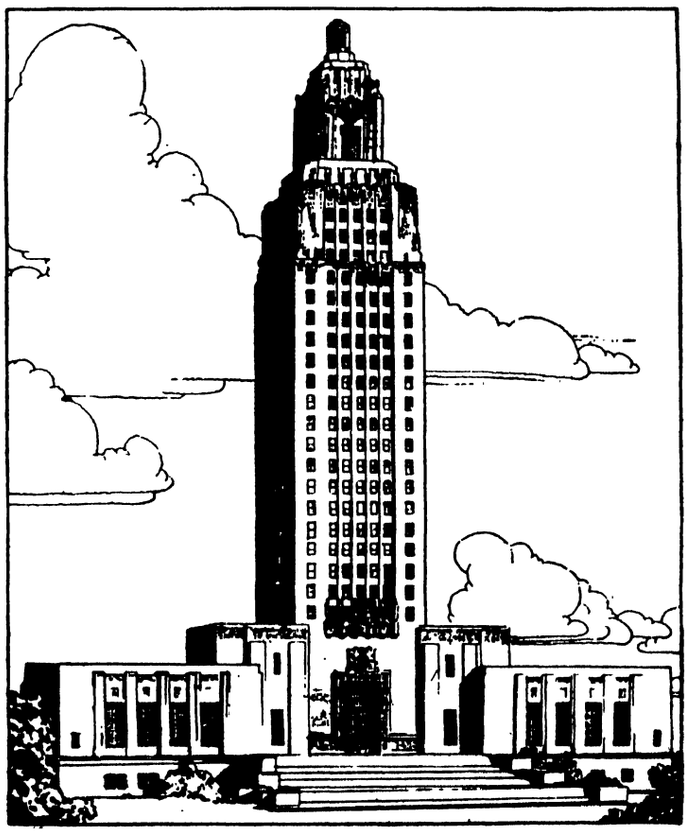
The state provides for higher education in the Louisiana State University and Agricultural and Mechanical College at Baton Rouge, Tulane University of Louisiana at New Orleans, the Louisiana State Normal College at Natchitoches, Southwestern Louisiana Institute at Lafayette, Louisiana Polytechnic Institute at Ruston, Southern University (for Negroes) at Scotlandville and New Orleans City Normal School. Among other educational institutions are Centenary College at Shreveport, Louisiana College at Pineville, Loyola University at New Orleans and for Negroes, New Orleans University and Straight College, both at New Orleans.

Population. In 1930 Louisiana ranked twenty-second among the states with a population of 2,101,593 or an average of 46.3 per square mile, an increase of 303,084 or 16.9% over 1920. The population rose from 153,407 in 1820 to 517,762 in 1850, 1,381,625 in 1900, 1,656,388 in 1910 and to 1,798,509 in 1920. In 1930 there were 1,318,160 or 62.7% whites and 776,326 or 36.9% Negroes, an increase from 1920 of 20.2% whites and 10.9% Negroes. Of the whites 1,283,250 were native born and 34,910 foreign born. The rural population was 1,268,061 or 60.3% of the total, an increase of 97,715 or 8.3% from 1920; the urban population was 833,532 or 39.7% of the total, an increase of 205,369 or 32.7% since 1920. There were in 1930 five cities with a population of 20,000 and upwards: New Orleans, 458,762; Shreveport, 76,655; Baton Rouge, 30,729; Monroe, 26,028; Alexandria, 23,025.

Occupations. In 1930 815,616 persons, or 38.8% of the population, were gainful workers 10 years old or older; 76.5% of these were males and 23.5% were females; 54.9% were native white; 2.5% foreign-born white, and 42.3% Negro. Among the chief occupations, with number of workers, were farmers, 158,820, and farm wage workers, 72,212; servants, 47,796; factory laborers, 42,918, including 18,209 men in saw and planing mills; factory operatives, 18,008 men and 7,729 women; clerks, 18,337 men and 6,784 women; retail dealers, 24,041; salespersons, 16,610 men and 7,181 women; laundresses, 20,096; general building laborers, 16,152; school teachers, 2,057 men and 11,967 women; chauffeurs, 13,194, and carpenters, 12,321.

HISTORY

Possibly Alvarez de Pineda in 1519, or Narvaez a decade later (*see* FLORIDA), discovered the lower Mississippi. Survivors of DE SOTO's expedition descended the Mississippi to its mouth in 1542. The period of French exploration and settlement began with the journey of LA SALLE in 1682. Iberville, heading a colonizing expedition under the auspices of the Comte de Pontchartrain, reached the Gulf Coast safely in 1699, and built two posts, Ft. Maurepas (*see* MISSISSIPPI) and in 1700 a fort on the Mississippi about 50 miles above the mouth. Bienville, his brother, governor of the colony, was primarily responsible for its perpetuation through a period of disappointments. Antoine Crozat held Louisiana—loosely speaking, the Mississippi valley—as a private concession from 1712 to 1717, and was persuaded by financial losses to surrender his charter to the "Company of the West," headed by John Law. Colonization was actively encouraged and Negro slaves were imported, but misguided agricultural experimentation, restrictions of the French colonial policy, and quarrels among the officials hampered the colony. Louisiana was surrendered to the king in 1731, and was again an annual drain upon the royal treasury. Cotton culture began in 1740, when Iberville had already introduced sugar-cane; prosperity from the one source awaited the invention of the



COURTESY LOUISIANA EXECUTIVE DEPARTMENT

LOUISIANA STATE CAPITOL, BATON ROUGE

cotton gin, and from the other the improved means of crystallizing sugar introduced toward the close of the century.

Louisiana west of the Mississippi, with the Isle of Orleans (upon which New Orleans had been planted in 1718), was ceded to Spain in the TREATY OF FONTAINEBLEAU, in 1762; in the following year Great Britain received the territory east of the river (*see* PARIS, TREATY OF, 1763). The unconsulted inhabitants vehemently protested the cession; a revolt in 1768 was sternly suppressed by the Spanish General O'Reilly the following year. O'Reilly, as governor, after Louisiana was belatedly transferred to Spain on Apr. 18, 1769, permitted the colony to remain essentially French, established an improved governmental system, and encouraged commercial enterprise. But the westward extension of settlement in the United States in its relation to the Spanish control of Louisiana gave rise to international intrigues, pioneers' demands for the free navigation of the Mississippi which were not satisfied by the conditional concessions of the Spanish authorities, and, climactically, the LOUISIANA PURCHASE of 1803. The portion of the Purchase south of latitude 33° was organized as the Territory of Orleans by act of Congress, Mar. 25, 1804; renamed Louisiana, the Territory was admitted to the Union on Apr. 30, 1812, and, a few days later, by the addition of West Florida west of the Pearl River, attained its present boundaries. New Orleans remained the capital until 1825, was again the political center in 1831-1849 and in 1864-1882; Donaldsonville was the capital in 1825-1831, Baton Rouge in 1849-1864 and again after 1882. The scene of one famous engagement in the WAR OF 1812 (*see* NEW ORLEANS, BATTLE OF), Louisiana was a military field throughout most of the CIVIL WAR. RECONSTRUCTION was attended by greater turbulence than in most of the ex-Confederate States. The Democratic party has enjoyed control since the withdrawal of federal troops in 1877, but, because of the state's sugar-cane interests, its congressmen have consistently supported protective tariffs. Louisiana's politics have been characterized by intense personal factionalism. In a year of national depression, 1930, the state was conspicuous in its approval at the polls of large bond issues for the extension of a highway system of paved roads, for a new state capitol, and for bridging the Mississippi at New Orleans. A strictly Democratic member of the Solid South as always, Louisiana in 1932 gave its 10 electoral votes to the Democratic presidential nominee, Franklin D. Roosevelt. John H. Overton, Democrat, was elected to the United States Senate.

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LOUISIANA POLYTECHNIC INSTITUTE, a non-sectarian technological college for men and women located at Ruston, La. Founded by the State of Louisiana in 1894, it is state supported and controlled. The institution maintains departments of arts and sciences, commerce, engineering, home economics and music, and a summer school. In 1930 there were 1,865 students and a faculty of 65, headed by Pres. G. W. Bond.

LOUISIANA PURCHASE, 1803. Louisiana, as acquired by Spain in 1762 and secretly retroceded to France in 1800, roughly embraced the domain from the Mississippi River to the crest of the Rocky Mountains, and possibly included Texas. Rumors of the cession of Louisiana to France, ultimately confirmed, greatly alarmed President Jefferson and other American statesmen, who anticipated the control of New Orleans and the west bank of the Mississippi by a strong foreign power, in contradistinction to the decadent power of Spain, as a menace to American security. Robert R. Livingston, the American minister to France, was instructed to prevent the consummation of the retrocession; or, at best, to secure New Orleans and the Floridas, assuming that both East and West Florida had been included in the retrocession of Louisiana, for the United States. In the event that Spain had retained East Florida or both Floridas, Livingston was instructed to endeavor to enlist the good offices of France in persuading Spain to sell that domain to the United States. The closure of the lower Mississippi to American commerce by the Spanish Intendant at New Orleans, Oct. 16, 1802, in probable violation of the TREATY WITH SPAIN, 1795, prompted the United States to hasten action. James Monroe was dispatched to Paris with plenipotentiary powers to offer as much as 50,000,000 francs for New Orleans and West Florida. Monroe arrived at Paris Apr. 12, 1803; but meanwhile Napoleon, anticipating the renewal of war with Great Britain and convinced that he could not prevent the capture of Louisiana by British forces, had through Talleyrand proposed to Livingston that the United States purchase the whole of Louisiana. Livingston and Monroe, without waiting for authorization to meet this unexpected proposal, quickly closed negotiations, the Marquis de Barbe-Marbois acting for Napoleon. By the treaty, signed Apr. 30, 1803, the United States acquired for 80,000,000 francs, including 20,000,000 francs for the assumption of the claims of American citizens against France for certain spoliations, an area of approximately 1,000,000 square miles. The exact limits of Louisiana were not specified. East Florida evidently remained in the possession of Spain; but ownership of West Florida was uncertain, and the western boundary of the Purchase was not defined until the TREATY WITH SPAIN, 1819. The treaty of 1803 provided that the inhabitants of Louisiana be incorporated into the Union, and admitted to the full privileges and immunities of citizens of the United States as soon as possible; that for a specified period French and Spanish ships should enjoy free admission to the Mississippi, while other foreign ships should be excluded; and that the treaty be ratified within six months. Because of this time limitation Jefferson, who would have preferred to await the enactment of an amendment of the Constitution expressly authorizing the National Govern-

ment to acquire new territory, suppressed his STRICT CONSTRUCTIONIST qualms as to the constitutionality of such acquisition, and called a special session of Congress for the immediate ratification of the treaty and the voting of the necessary funds. After furious debates sharply along party divisions, the FEDERALISTS opposing the treaty and the DEMOCRATIC-REPUBLICANS advocating it, the Senate ratified the treaty, Oct. 19, 1803, and both Houses agreed upon the contingent appropriations. On Dec. 20, 1803, the United States took formal possession at New Orleans, and on Mar. 9, 1804 at St. Louis. The purchase was of incalculable influence upon the destiny of the United States.

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LOUISIANA STATE UNIVERSITY AND AGRICULTURAL AND MECHANICAL COLLEGE, at Baton Rouge, La., a coeducational state institution, begun as the Louisiana State Seminary of Learning and Military Academy. It was founded near Alexandria in 1853 and opened in 1860, with WILLIAM TECUMSEH SHERMAN as the executive officer. When the building was destroyed by fire in 1869, the institution was moved to temporary quarters in Baton Rouge. The present title was assumed in 1870, and in 1877 the university was consolidated with the Agricultural and Mechanical College, founded at New Orleans in 1873. It comprises colleges of Arts and Sciences, Agriculture and Engineering, the Audubon Sugar School, Law School, and Teachers' College. The library of 64,042 volumes contains special files of Louisiana newspapers. In 1930 there were 3,844 students, and a faculty of 180 headed by Pres. THOMAS W. ATKINSON.

LOUISVILLE, the largest city of Kentucky, a port of entry and the county seat of Jefferson Co., situated on the Ohio River, in the northern part of the state, about 90 mi. southwest of Cincinnati, O. Transportation is provided by ten trunk railroads, river steamers, bridges and ferries crossing the Ohio River, traction, bus and motor truck lines and an airport. Louisville is one of the most important commercial and industrial centers of the South. It is an important leaf tobacco, grain, spring-lamb and live stock market. In 1929 its wholesale trade developed a total volume of $251,020,820. It has railroad repair shops, meat-packing and printing plants and creameries. Its manufactures, which had a total value of approximately $262,000,000 in 1929, included tobacco products, agricultural implements and plumbing equipment. In 1929 the 3,968 retail stores in the city, which did a total business of $155,563,436, gave full-time employment to 16,392 men and women, and the wholesale trade amounted to $12,100,651. A branch of the Federal Reserve Bank, a Federal Land Bank and an Intermediate Farm Loan Bank are located here.

Also in the city is the University of Louisville, the state school for the blind, Baptist and Presbyterian theological seminaries, law and pharmacy schools, a Negro university and many other public and private educational institutions. The most famous classic of the American turf, the Kentucky Derby, is held every May at Churchill Downs and attracts thousands of visitors. The State Fair at Louisville also draws large numbers.

In 1778 Gen. George Rogers Clark, pushing into the Illinois country, left a small group of colonists on an island near the head of the Ohio Falls. They moved to the mainland the following year and fortified the site of the present city. On May 14, 1780, the town was incorporated under the name of Louisville, in honor of King Louis XVI of France. Gen. Clark made Louisville his home after his successful expedition into the Illinois country, and his grave is here. Louisville was chartered as a city in 1828, and several times subsequently. Pop. 1920, 234,891; 1930, 307,745.

LOUISVILLE, UNIVERSITY OF, a non-sectarian, coeducational university, situated at Louisville, Ky., was founded in 1837. Originally the institution maintained only schools of law and medicine, but later it added a College of Liberal Arts, Louisville College of Dentistry, the Speed Scientific School, a Graduate School and Summer School. Of greatest interest among the buildings is the J. B. Speed Memorial Museum of Fine Arts. The total assets, 1931, were $2,383,734. The library contained 39,920 books. In 1931-32 the university enrolled 2,015 students and had a faculty of 371 members, headed by Pres. RAYMOND A KENT.

LOUNSBURY, THOMAS RAYNESFORD (1838-1915), American literary historian, was born at Ovid, N.Y., Jan. 1, 1838, and graduated in 1859 at Yale. He served in the Civil War and subsequently studied Early English literature while teaching in New York City. Beginning in 1871, he was for 35 years Professor of English Language and Literature at the Sheffield Scientific School, Yale, becoming especially well known as an authority on Chaucer, Shakespeare and on Early English. Lounsbury's works include *History of the English Language, Studies in Chaucer, Shakespeare as a Dramatic Artist* and *Life of James Fenimore Cooper.* He died Apr. 9, 1915.

LOURDES, a town in southern France, built at an altitude of 1,400 ft. about a medieval castle in the foothills of the Pyrenees. It is a celebrated place of pilgrimage; since 1870 the number of pilgrims has averaged 600,000 annually. Lourdes' importance dates from the visions of a young shepherdess in 1858. Pop. 1931, 10,651.

LOURENÇO MARQUES, or **LORENZO,** a port and capital of MOZAMBIQUE, Africa. It is situated on Delagoa Bay and is the terminus of the Delagoa Bay railroad which connects it with Pretoria and mines in the vicinity. The town is modern, with a street-car system, well-planned and lighted streets, railways, postal, telegraph and motor-bus service, theaters, museum and wireless. The quay, built at a cost of £500,000, is extremely well-equipped and can ac-

commodate 12 steamers at the same time. An active trade is carried on, chiefly in coal, liquors, iron, lumber and foodstuffs. Pop. 1927, 37,301.

LOUSE, an insect of the order *Anoplura* (or *Siphunculata*). These are the true lice, and should not be confused with bird lice (order *Mallophaga*) which have chewing mouthparts. True lice are wingless insects. They develop without metamorphosis. Mouthparts are fitted for piercing and sucking. Parasitic upon mammals, whose blood they suck. The body is flattened, the head free and horizontal. Each leg is provided with a claw, for clinging to hairs of the host. Eggs, known as "nits," are glued to the host's hairs. Three species are parasitic upon man. These are the head-louse (*Pediculus capitis*), the body-louse (*P. corporis*) and the crab-louse (*Phthirius pubis*). Several species attack wild and domestic animals. Lice are known to be carriers of typhus fever, trench fever and relapsing fever. J. R. T.

LOUVAIN, an old town in Belgium, the country's most celebrated university center. The University of Louvain was founded in 1426 by Duke John IV of Brabant, and in the 16th century had more than 6,000 students; the present enrollment is approximately 3,300. Louvain made Belgium's last stand against the invading Germans in 1914. When the enemy entered, Aug. 19, they burned a large part of the town, destroying the university with its world-famous library and leaving the 15th century cathedral of St. Pierre in ruins. The library was rebuilt through American contributions and was designed by the American architect, Whitney Warren. Books and furnishings have been sent by many nations, including 300,000 volumes from Germany as reparation, and nearly 50,000 as a gift from Manchester, England. The cathedral has also been restored. As the capital of Brabant in the 14th century, Louvain was the center of a flourishing wool trade and weaving industry, but its commercial importance later gave place to that of Brussels. Pop. 1930, 40,028.

LOUVRE, THE, a large group of buildings in Paris, France, originally used as a fortress and prison, later as a royal residence and now one of the best known art museums. Begun as a fortress by Philip Augustus in the early part of the 13th century, it was enlarged and rebuilt by succeeding monarchs until it became the largest structure in Paris. The so-called old Louvre comprising the southwestern pavilion, the west front and the south side of the present building was built after designs by Pierre Lescot under Francis I. The hall which connects the Louvre with the Tuileries Palace on the south was begun under Henri IV. The central portion of the building was completed under Louis XIII and Louis XIV. Claude Perrault erected the neoclassic colonnade and the eastern façade. The above-mentioned gallery connecting the Louvre and the Tuileries Palace was finally completed at a cost of about $15,000,000 in 1859. In 1871 the noted Richelieu pavilion was burned by communists. Numerous restorations have been made in the Louvre in the present century.

The Louvre was set aside in 1793 as a national gallery and was at first made up largely of royal collections. Napoleon I very energetically sponsored the new museum and added to it many works of art levied from conquered nations. Now it contains the largest collection of paintings in the world, splendid collections of ancient and modern sculptures, tapestries, furniture, engraving, drawings, gems and other works of art. It incorporated the Museum of Decorative Arts in 1909. Of its sculptures the most noteworthy are the Egyptian collection, the Carthaginian, the Venus de Milo, the Victory of Samothrace, the Hera of Samos and the Renaissance sculptures. Of the paintings the best known are probably Leonardo da Vinci's *Mona Lisa* and *The Virgin of the Rocks.* Other artists particularly well represented are Van Dyck, Rubens, Raphael, Titian, Veronese, Tintoretto, Correggio, Velasquez, El Greco, Murillo, Goya and the painters of the Dutch school and of the modern French school.

LOUYS, PIERRE (1870-1925), French poet and novelist, was born at Paris, Dec. 10, 1870, of a wealthy family. He was carefully educated for a military career, and in 1890 founded a literary review, *La Conque,* with Swinburne, Mallarmé and Maeterlinck among the contributors. His first poems, *Astarte,* appeared in 1891. *Aphrodite,* 1896, became unfortunately notorious for its impropriety, although, allowing for the author's essentially Greek view of life, it is an excellent historical novel. Louys published several volumes of short stories. *Crepuscule des nymphes* appeared a few weeks before his death, on June 4, 1925 at Paris.

LOVAGE (*Levisticum officinale*), a smooth perennial herb of the parsley family cultivated for its aromatic fruits. It is a tall plant native to southern Europe with dark green shining leaves, greenish-yellow flowers and dry, oblong, deeply ribbed seed vessels.

LOVE BIRD, the name given to a genus (*Agapornis*) of small African parrots because of the affection which the sexes seem to show for each other. They are all less than 7 in. long, with thick, deep bills, extremely short tails conspicuously banded with black, and greenish or grayish plumage often with red or blue markings. One of the best known is the rosy-faced love bird (*A. roseicollis*) found in southwest Africa. It moves in small flocks, feeding largely on berries, and breeds in nests abandoned by other birds. The handsome parrotlets (*Psittacula* sp.), mostly less than 5 in. in length, found from Mexico to Brazil and Bolivia, are known also as American love birds. Various love birds are kept as household pets.

LOVEDALE, an educational and mission station of the Cape of Good Hope, Africa, in the eastern division of Victoria. It is situated on the sides of the Chumie River; Cape Town lies 650 mi. to the southwest and King William's Town 40 mi. to the south. Besides the dissemination of religious knowledge, instruction is given in printing, farming, car-

pentry and telegraphy. The methods of teaching and the structure housing the pupils are modern and have served as models for other missionary groups.

LOVEJOY, ELIJAH PARISH (1802-37), American abolitionist, was born at Albion, Me., on Nov. 9, 1802. After graduating in 1826 at Waterville College, he went to St. Louis where he edited a Whig paper in 1828-32. In 1834 he established the *St. Louis Observer,* which became a widely read and influential Presbyterian paper. By denouncing slavery as an evil in an editorial, he aroused dangerous animosity against himself; in 1836 he left St. Louis and went to Alton, Ill., with his press, which was immediately seized by a mob. The townspeople gave him another, and he began publishing the *Alton Observer* in which he ardently advocated abolition. Twice more his press was destroyed and replaced. In the fourth attack, on Nov. 7, 1837, Lovejoy was killed defending his property. His martyrdom was regarded as a direct challenge by the abolitionists, who increased their attacks upon the northern defenders of the institution of slavery.

LOVELACE, RICHARD (1618-58), English poet, was born at Woolwich, Kent, in 1618. He was educated at Oxford, and wrote verse while there. One of the young court poets, he was imprisoned when 24 for activity in the Royalist cause. In prison he wrote the famous lyric, *To Althea from Prison.* When liberated he continued to work for the king, and was again imprisoned in 1648. During this second imprisonment Lovelace prepared for publication the volume, *Lucasta,* in which many of the poems had been previously published. The finest of his lyrics is perhaps *To Lucasta, on Going to the Wars. The Posthumous Poems of Lovelace* appeared in 1659. Having spent his fortune in the king's service, the poet died in 1658, poverty-stricken in a London slum.

LOVELAND, a city in Larimer Co. in northern Colorado, situated on the plains east of the Rocky Mountains, on the Big Thompson River, 52 mi. north of Denver. Bus lines and two railroads serve the city. The fertile region produces sugar-beets, grain, peas and fruit, especially cherries. Loveland has a large beet-sugar mill, canneries, a flour mill and a condensed milk plant. Fort Namaqua was built on this site in 1859 as a trading post on the Overland trail. Loveland was founded in 1877 and incorporated in 1878. Pop. 1920, 5,065; 1930, 5,506.

LOVE-IN-A-MIST (*Nigella damascena*), a common flower-garden annual of the crowfoot family. It is a native of southern Europe and has become sparingly naturalized in the eastern United States. The smooth erect stem, a foot or more high, bears divided, fennel-like leaves and large white or bluish flowers, 1½ in. across. The flowers, borne singly at the ends of branches, are overtopped by a very finely divided leafy involucre, whence the common name.

LOVE-LIES-BLEEDING (*Amaranthus caudatus*), a widely grown garden annual of the amaranth family. It is a native of the tropics with numerous varieties and races in cultivation. The stout, profusely branching stem, 3 to 5 ft. high, bears numerous, showy, drooping spikes of small red flowers.

LOVER, SAMUEL (1797-1868), Irish writer, was born at Dublin, Feb. 24, 1797. He experimented with art, and his portrait of Paganini was exhibited at the Royal Academy in 1833. Meantime he wrote ballads, including *Rory O'More,* and presently gave up painting. He successfully dramatized his prose version of *Rory O'More* and published *Songs and Ballads* in 1839. The rollicking farce, *Handy Andy,* appeared in 1842, and was Lover's greatest success. He gave evening entertainments from his own works, and devoted his later years to song-writing. He died at St. Helier, July 6, 1868.

LOVE SEAT, a kind of small upholstered SOFA, with the appearance of a double chair. It is closely allied with the SETTEE, but has a lower back and is a more compact and less formal piece of furniture. In France under Louis XIV, and in England in the Queen Anne and early Georgian periods, it reached its highest development. An important piece at the time, the finest examples show the characteristic shell carving, cabriole legs and ball-and-claw feet. It was generally made of crotch walnut, but later mahogany and other woods were used with charming effect. The love seat was much in vogue during the Victorian period in both England and America, and the piece is frequently employed in modern decorative schemes.

LOVE'S LABOUR'S LOST, a comedy by SHAKESPEARE, possibly the poet's earliest original dramatic work, written about 1590. This is an epigrammatic comedy of four gentlemen—Ferdinand, king of Navarre, and his three attendants, Biron, Longaville and Dumain—who, after promising themselves three years of studious solitude, to be unmolested by any woman, are foiled of their purpose by four bewitching ladies, the Princess of France, and Rosaline, Maria and Katherine. The comic situation reaches the highest point of its witty career in the scene when four pairs of lovers, all in disguise, mistake each the other's identity, and closes merrily with a mutual agreement that the suits shall be seriously resumed at the end of a year and a day.

LOVETT, EDGAR ODELL (1871-), American educator, was born in Shreve, O., Apr. 14, 1871. He graduated from Bethany College in 1890 and took his Ph.D. at the University of Leipzig in 1896. The following year he joined the faculty of Princeton University, serving successively as instructor, assistant professor, 1898-1900, professor of mathematics, 1900-05, and professor of astronomy, 1905-08. In the latter year he was elected president of Rice Institute. His writings on geometry and astronomy have appeared frequently in educational journals.

LOW, SETH (1850-1916), American educator and publicist, was born at Brooklyn, N.Y., Jan. 18, 1850. After graduating from Columbia University (then Columbia College) in 1870 he joined his father in the latter's tea importing firm, remaining until 1888. From 1882-86 he was mayor of Brooklyn and cleaned

up much of the political graft which then prevailed. In 1890 Low was elected president of Columbia College. Under his guidance the college made rapid growth and became an outstanding, well-organized university. In 1895 he erected the Low Memorial Library, which was made the center of the new campus on Morningside Heights. In order to become a candidate for mayor of New York in 1897, he resigned his presidency. He was defeated, but four years later was elected for one term. He was a member of the Colorado miners' strike commission, 1914, and was frequently an arbiter in other labor conflicts. Low died at Bedford Hills, N.Y., Sept. 17, 1916.

LOW, WILL HICOK (1853-), American artist, was born at Albany, N.Y., May 31, 1853. He worked for illustrated periodicals in New York, and went to Paris in 1873, where he studied under Gérôme and Carolus-Duran. He exhibited at the Paris Salon and returned to New York. Low is best known for his mural decorations, examples of which are in Essex County Court House, Newark, N.J.; Luzerne County Court House, Wilkes-Barre, Pa.; Federal Building, Cleveland; St. Paul's Church and State Education Building, Albany, N.Y. Other works are *Orange Vender* and 60 drawings in the Art Institute, Chicago: *Christmas Morn,* National Gallery, Washington; and *Aurora,* Metropolitan Museum, New York. Low has also written several books.

LOWBOY (from the French *bois,* wood), a low chest of drawers on short legs, the top of which may be used as a table. It was a popular piece in England and America in the 18th century. Walnut or oak were the favorite woods until about 1720, when the fashion shifted to mahogany, which was very elegantly fashioned and carved by the Chippendale school, with cabriole legs, claw-and-ball feet and shell motifs.



COURTESY M. M. OF ART
AMERICAN COLONIAL LOWBOY, VENEERED IN BURLED WOOD

LOWDEN, FRANK ORREN (1861-), American legislator, was born at Sunrise City, Minn., on Jan. 26, 1861. He was graduated from Iowa State University in 1885, received his law degree from the Union College of Law in Chicago in 1887, and began to practice the same year in Chicago. He taught during 1899 as professor of law at Northwestern University. The next year and in 1904 he was a delegate to the Republican National Convention, and from 1904 to 1912 was a member of the Republican National Committee. He was appointed in 1906 to fill a vacancy in the House, and was reelected to the House in 1907 and 1909. He was governor of Illinois from 1917 to 1921. He was a strong candidate for the Presidential nomination in 1920, and was nominated unanimously for Vice-President in 1924, but declined to run. He was a candidate for the Presidential nomination again in 1928, but was defeated by Herbert Hoover. He has contributed many articles to periodicals on the subjects of farm relief and reforms in government administration.

LOWE, MOUNT, a peak of the Sierra Madre Mountains in southern California, situated approximately 15 mi. northeast of Los Angeles. The mountain rises to an elevation of 5,650 ft. above sea level and the top is occasionally covered with snow during the winter months. An electric railway ascends to a point within easy walking distance of the summit where a magnificent view of the mountains, valleys, orchards, cities and towns of the surrounding country is obtained. The foot of the mountain is reached by the Pacific Electric railway from Pasadena or Los Angeles and by excellent motor highways.

LOWELL, ABBOTT LAWRENCE (1856-), American university president, was born in Boston, Mass., on Dec. 13, 1856. He was educated at Harvard and at Harvard Law School, graduating in 1880. For some time he practiced law in Boston. In 1897 he became lecturer on government at Harvard, in 1900 professor of the science of government, and in 1903 Eaton professor. He succeeded Charles Eliot as president of the university in 1909 and completely reorganized its finances. Lowell has been awarded a large number of foreign university degrees and has been accorded many American distinctions, including membership in the American Academy of Arts and Letters and trusteeship of the Carnegie Foundation for the Advancement of Teaching. He became the sole trustee of the Lowell Institute in Boston in 1900. His published works include *Essays on Government; Governments and Parties in Continental Europe,* later reissued as *The Governments of France, Italy and Germany,* and considered the best work in English on this subject; and *The Government of England.* Lowell resigned the presidency of Harvard on Nov. 21, 1932.

LOWELL, AMY (1874-1925), American poet, critic and lecturer, was born at Brookline, Mass., Feb. 9, 1874, the sister of ABBOTT LAWRENCE LOWELL and Percival Lowell. Her first volume of verse, *A Dome of Many Colored Glass,* appeared in 1914. Other books of verse were *Sword Blades and Poppy Seeds* and *Can Grande's Castle.* Among her critical works of importance were *Six French Poets, Tendencies in Modern American Poetry* and *John Keats,* 1925, a biography in which she endeavored to interpret that poet modernistically. *What's o'Clock,* 1925, *East Wind* and *Ballads for Sale,* 1927, are posthumous collections of her verse. Amy Lowell's most important contribution to American letters was the development and perfecting of the technique of free verse. She died May 12, 1925, at Brookline, Mass. *See also* VERS LIBRE.

LOWELL, JAMES RUSSELL (1819-91), American diplomat and man of letters, was born in Cambridge, Mass., Feb. 22, 1819, of distinguished New England stock. He grew up in clerical and collegiate air, graduated at Harvard in 1838, was admitted to the bar in 1840, but preferred literature to law. In 1844 he married Maria White, a poetess of distinc-

tion, who died in 1851; his second marriage in 1857 was to Frances Dunlap. Much of Lowell's calm, scholarly life was spent at Elmwood, the family home on the outskirts of Cambridge; he was indifferent to wealth and profit, and after 1861 a patrimony smoothed for him the material factors of living. For 20 years, beginning in 1856, Lowell was Professor of Modern Languages at Harvard, a position previously held by LONGFELLOW. He served as the first editor of the *Atlantic Monthly,* 1857-61, and was joint editor with CHARLES ELIOT NORTON of the *North American Review* from 1862-72. He was made Ambassador to Spain in 1877, and from 1880-85 was Ambassador to England. Lowell's last years were spent in Cambridge, Mass., where he died Aug. 12, 1891.

Lowell was a distinguished poet, journalist, essayist and orator. His first publication was a book of poems, *A Year's Life,* 1841, and among his later poetic works are *A Fable for Critics, The Vision of Sir Launfal, The Biglow Papers, Under the Willows and Other Poems, Heartsease and Rue* and *Last Poems,* 1895. He lacked the fire of the greatest poets, yet his verses have great charm and show in execution fastidious care and subtlety. Of all his poems the three best known are perhaps THE VISION OF SIR LAUNFAL, *The Biglow Papers* and the *Ode Recited at the Harvard Commemoration in 1865. The Biglow Papers* are satirical verses written in the speech of rustic New England, and in these and the prose *Biglow Papers* Lowell expressed many of his political convictions. In prose he wrote numerous critical studies of authors and literary movements, his studies of Chaucer, Dante, Shakespeare, Milton, Pope, Lessing, Rousseau, Emerson and Thoreau being especially memorable. He also produced many political essays and some delightful travel sketches, including *Fireside Travels,* 1864. His gifts as an orator, developed notably during his diplomatic service, were perhaps most fully realized in the *Address on Democracy,* delivered in 1884 at Birmingham, England. For a quarter of a century Lowell was the most influential figure in American letters. A man of profound learning and exquisite, sound taste, sincere, calm, deeply patriotic, he combined the finest of European culture with the best of his Puritan heritage. *See also* AMERICAN LITERATURE.

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LOWELL, PERCIVAL (1855-1916), American astronomer, was born at Boston, Mass., Mar. 13, 1855. In 1894 he founded the Lowell Observatory at Flagstaff, Ariz., where he worked on his observations of Mars. He early had become convinced, and remained so all his life, that the surface showed evidence of a conscious life existing on that planet. He drew many maps of the Martian topography and wrote *Mars and Its Canals,* 1906, and *Mars as the Abode of Life,* 1909. He died at Flagstaff, Ariz., Nov. 12, 1916.

LOWELL, a city in northeastern Massachusetts, a county seat of Middlesex Co., situated on the Merrimack and Concord rivers, about 25 mi. northwest of Boston. The Boston and Maine and the New Haven railroads afford transportation. There is an airport. Long known as the Spindle City, Lowell produces chiefly cotton goods. It has other important and diversified industries as well, including the manufacture of patent medicines. The value of its industrial output in 1929 was $68,580,418 and the retail trade amounted to $46,047,207.

Lowell grew up around a small village settled before 1800. With the establishment of the Merrimack Manufacturing Company in 1822, it developed as an important textile center, becoming at the end of the last century the greatest producer of cotton cloth in America. Most of the mill hands were girls, and the leading manufacturing firm encouraged them in organizing their own clubs and fostered their interests outside the plant. In 1826 the town was incorporated and named after Francis Cabot Lowell, who had been influential in promoting the cotton industry. The famous painter, JAMES MCNEILL WHISTLER, was born here, as was also Lucy Larcom, the poet. Lowell is the seat of a State Normal School and of the largest textile school in the world. Pop. 1920, 112,759; 1930, 100,234.

LOWELL INSTITUTE, an educational foundation in Boston, Mass., established by the will of John Lowell, Jr., in 1836. His bequest of $250,000 has grown to over $1,500,000. The fund is used to provide lectures by distinguished scholars on literature, religion, art, history and education, university extension courses and an engineering school. The trusteeship of the fund is to be kept in the Lowell family if possible. ABBOTT LAWRENCE LOWELL, President of Harvard University, was made trustee in 1900.

LOWER CALIFORNIA, a territory of Mexico, forming a long narrow peninsula, lying at the extreme northwest portion of the country, between the Pacific Ocean and the Gulf of California. For political reasons it is divided into two districts, the northern and the southern, with a combined area of 55,654 sq. mi. The eastern part of the territory is crossed by mountains rising abruptly from the coast to a backbone in the central part, and then sloping gradually to the Pacific Ocean on the west. Almost the entire region is arid, destitute of waterways and has little rainfall. Copper-, gold- and iron-mining in the interior and pearl and turtle fishing on the coast are the principal occupations of the territory. The capital of the northern division is Mexicali, and of the southern La Paz. Pop. 1921, 62,831; 1930, 94,469.

LOWESTOFT, a seaport and watering place of Suffolk, England, lying on the once natural and now artificial outlet of the Wavenay into the North Sea, about 117 mi. northeast of London. The most easterly town in England, it owes its origin to its fisheries. South Lowestoft, the modern outgrowth of harbor improvements begun in 1844, has a fine esplanade, parks and other resort attractions. The older section of Lowestoft is picturesque, characterized by lanes or scores running in rays from the High street

to the shore. During the latter part of the 18th century china manufacture flourished. The fisheries still remain of primary importance, and shipbuilding and fitting, engineering, and the manufacture of textiles are carried on. Pop. 1921, 44,323; 1931, 41,768.

LOWIE, ROBERT HARRY (1883-), American anthropologist, was born at Vienna, Austria, June 12, 1883, and brought to the United States at the age of 10. He was graduated in 1901 at the College of the City of New York, continued his studies at Columbia University, and in 1908 entered the department of anthropology of the American Museum of Natural History, New York City, where he was associate curator during 1913-21. During 1916-17 he served as president of the American Folk-Lore Society. He was associate professor of anthropology at the University of California in 1917-18 and again during 1921-25. In the latter year he became professor of anthropology there. From 1912 to 1924 he was associate editor of the *American Anthropologist,* and editor in chief after 1924. Dr. Lowie has undertaken anthropological expeditions among the American Indians, particularly those tribes inhabiting the Plains and Plateau areas, his observations resulting in important monographs on the subject. His *Primitive Society,* published in 1920, is generally considered one of the most important contributions to modern anthropology. Among his other works are *Culture and Ethnology, Myths and Traditions of the Crow Indians, Primitive Religion, The Origin of the State,* and *Are We Civilized?,* the last work published in 1929.

LOWLANDS, THE SCOTTISH, a broad valley section of Scotland between the firths of Forth and Clyde. It is the most fertile and densely populated part of the country. Industries are provided with shipping facilities by the firths; coal fields are in Lanarkshire and Ayrshire, and oil shale is found in Midlothian. Besides manufacturing, there is shipbuilding, brewing, pottery and glassworks and a large textile industry.

LOW SUNDAY, the first Sunday after Easter. The origin of the name is doubtful, but it is believed that its proximity to Easter, the highest of the feasts, caused it to be so named. It was formerly known as "White Sunday" also, from the Roman Catholic term *Dominica in albis,* "Sunday in White Garments," referring to the white garments worn for the last time by the neophytes of the early Church on that day.

LOWVILLE, a village in northern New York, the county seat of Lewis Co. It is situated near the Black River, 50 mi. northwest of Utica and is served by the New York Central Railroad. Dairying and truck farming are carried on in the vicinity and local manufactures include cheese, furniture, coffins and paper boxes. The village is the seat of Lowville Academy, founded about 1808. Pop. 1920, 3,127; 1930, 3,424.

LOXODROMIC or **LOXODROME,** a curve cutting a meridian of a sphere at a constant angle. It is a double spiral with the poles as asymptotic points. It was invented by Pedro Nunes (Petrus Nonius, 1502-78), a well-known Portuguese writer on navigation, who mistakenly asserted that it was the shortest path between two points on a sphere. It is also known as a rhumb line (*rhombus,* line) and as a spherical helix (Latin, a clinging ivy, referring to its corkscrew shape). The name loxodrome means oblique course (Greek, *loxos* + *dromos*). If the constant angle is α, the longitude is λ, and the colatitude is κ, the curve is represented by $x = \sin\lambda\cos\kappa$, $y = \sin\lambda\sin\kappa$, and $z = \cos\lambda$.

LOXODROMIC LINES, in topography, lines drawn on a map in such a way as to make equal angles with all meridians they intersect. On a Mercator projection they appear as straight lines. Drawn on a globe they show themselves to spiral inward toward both poles.

LOYALISTS or TORIES in America, the colonists who were loyal to the British Government during the REVOLUTIONARY WAR. They included probably a third of the total population of the 13 colonies. Officeholders, the learned classes, holders of extensive property, natural conservatives and the wealthy commercial classes in the larger cities comprised most of the loyalist element. The revolutionary element, organized and aggressive, passed rigorous acts banishing many loyalists and confiscating their properties. Private acts of violence reinforced this official hostility, and as many as 90,000 loyalists went into exile, 1775-87. Canada, England, the Bahamas and the West Indies received large accessions, as did New York, Charleston and other cities held by the British army during the greater part of the Revolution. The extensive emigration to Canada and Nova Scotia profoundly affected the history of these provinces, providing an English counter-balance to the French element in the population. The British Government during and after the Revolution attempted to protect the interests of the loyalists, although many of them had failed to support the Revolution because they were opposed to a recourse to arms, not because they approved the repressive British policy. During the peace negotiations of 1783 the British commissioners secured concessions favorable to the loyalists; but the various states refused to enact the concessions, and the confiscated lands and property were not restored. The British Government itself indemnified many loyalists.

LOYAL LEGION OF THE UNITED STATES, MILITARY ORDER OF THE, society formed in 1865, after the Civil War, by commissioned officers of the United States army, navy and marine corps who were honorably discharged. At the first meeting, held the day after Abraham Lincoln's assassination, the objects of the society were declared to be the preservation of fellowship formed among companions in arms, the care of widows and orphans of deceased members and interest in the welfare of the soldiers and sailors of the United States. Membership passes from father to sons.

LOYOLA, ST. IGNATIUS (1491-1556), founder of the Society of Jesus, was born the youngest son of

Don Beltrán Yañez de Oñez y Loyola, at the castle of Loyola, above Azpeitia, Guipúzcoa, Spain, in 1491. He was baptized Iñigo, but assumed the name of Ignatius in later years. After a gay and probably wild youth as a page at the Court of Ferdinand and Isabella, and later as a soldier, he was brought to a serious consideration of life by a severe wound at the siege of Pamplona in 1521, when a French cannon ball injured his legs, tearing off the left calf and breaking the right shin. During convalescence his request for books of chivalry to read could not be granted, and he was given the lives of Christ and the saints, which led him subsequently to dedicate his life to a religious chivalry for the Church. In 1523 he started on an arduous and dangerous pilgrimage to the Holy Land, from which he did not return until 13 months later. After attempts at study at Alcalá and Salamanca, he entered the University of Paris in 1528. Six years later, with some fellow students, one of whom was St. Francis Xavier, the missionary "Apostle of the Indies," he started the Company of Jesus. The term JESUITS was given in reproach as early as 1544, and was never used by Ignatius, though accepted by the order in later years. The order was confirmed by Pope Paul III in 1540, and Loyola become its first General the next year. He wrote the *Constitution of the Order* and *Spiritual Exercises.* At his death in Rome, July 31, 1556, there were 1,000 members. He was canonized by Gregory XV in 1622.

LOYOLA COLLEGE, at Montreal, Quebec, Canada, a Catholic institution for men founded in 1896, and privately conducted by the Jesuits. It is affiliated with the MONTREAL UNIVERSITY. The library contains 15,000 volumes. In 1931-32 there was a student enrollment of 375, and a faculty of 31 headed by the Very Rev. E. G. Bartlett.

LOYOLA UNIVERSITY, a Catholic coeducational institution conducted by the Jesuit Fathers at Chicago, Ill. It had its origin in St. Ignatius College, established in 1870, but having assumed the proportions of a university, was incorporated under the present title in 1909. The old St. Ignatius now comprises the collegiate department of arts and sciences, an academy, and a commercial high school. Loyola Academy was established in 1909 as a second preparatory school. The other university departments include schools of law, commerce, medicine, dentistry and sociology, and extension, correspondence and summer schools. The endowment funds in 1931 were $103,725. There were 66,306 volumes in the library. In 1931-32 the student enrollment was 4,953, and the faculty of 489 was presided over by the Rev. ROBERT M. KELLEY.

LUBBER'S LINE, a line inside the bowl of a mariner's COMPASS. The compass is installed on a vessel with the lubber's line forward, so that a line between it and the pivot of the compass is parallel with the keel. Hence when a point on the compass card is opposite the lubber's line, the angle between the vessel's course and the geographical meridian can be calculated.

LUBBOCK, SIR JOHN, LORD AVEBURY (1834-1913), English scientist and man of letters, was born at London, Apr. 30, 1834. After a number of years devoted to study and writing upon the prehistory of the British Isles he turned to botany and entomology and published a number of valuable works on their interrelation. In 1890 he took his seat in the House of Lords and devoted himself to economic and political problems. He died at Ramsgate, May 28,

LUBBOCK, a city and the seat of Lubbock Co., northwestern Texas, situated 125 mi. south of Amarillo. Five branches of the Panhandle and Santa Fé railroads, the Fort Worth and Denver South Plains railroads and several bus lines serve the city. Lubbock is the wholesale center and the distributing point of the South Plains section. The surrounding territory is excellent cattle country. The chief crops of the vicinity are cotton, grain and sorghum. Cotton compresses, cottonseed oil mills and wholesale houses are among the principal industrial and commercial enterprises. In 1929 the retail trade was valued at $15,469,736. The South Plains country was opened about 1873, but Lubbock was not settled until 1891. It was named after Lieut. Tom Lubbock of Terry's Texas Rangers. It was incorporated in 1909. Pop. 1920, 4,051; 1930, 20,520.

LÜBECK, the third in population of the three free Hanseatic cities of Germany, and capital of the free state of Lübeck. It lies at the confluence of the Trave and the Wakenitz rivers, about 15 mi. from the Baltic Sea. It has oversea trade and industry. The maritime trade is largely with Scandinavia, Latvia, Esthonia and Finland. From the south the Elbe-Trave Canal flows in, uniting Lübeck with the interior of Germany. The old city, entirely surrounded by water, cherishes witnesses of medieval times: the Gothic churches with their high towers; the city gates; the rathaus, one of the most splendid in Germany; and, particularly on the side streets, gabled houses, both late-Gothic and Renaissance. The cathedral was built by Henry the Lion in 1173 as a Romanesque basilica and rebuilt in the 14th century in Gothic style. Other noteworthy buildings are St. Mary's Church, the Holy Ghost Hospital, the Museum for Art and the History of Art. Lübeck was founded in 1143 and became a free city in 1226. Its favorable situation made it a great trading center between the able artisans of the West and the shippers of raw materials from the East. Pop. 1925, 120,788.

LUBIN, DAVID (1849-1919), American agriculturist, was born in Poland, June 10, 1849, and came to America when a child. While conducting a dry goods business in Sacramento, Calif., he began to study the marketing and distributing of farm products and became an authority in that field. Among his important contributions to the advancement of agriculture are the introduction of the rural credits system in the United States, and the founding of the International Institute of Agriculture to furnish world-wide crop reports. Died in Rome, Italy, Jan. 1, 1919.

LUBLIN, capital of a Polish voievodship, on the Warsaw-Lwow Railway, about 100 mi. southeast of Warsaw by rail; situated on a hill on the Bystrzyca River. There is a fine market-place surrounded by picturesque side streets, particularly in the Jewish quarters. The Krakow and Grodzki gates recall the ancient town wall. There are several old churches including an 18th century Baroque cathedral and a Dominican church with a beautiful Chapel of the Holy Cross. The Castle, with the Holy Trinity Chapel, has several paintings dating from the 15th century. There are in addition to the cathedral 11 other Catholic churches, two Greek Orthodox churches, a Protestant church, a synagogue, a theological seminary, several religious orders, a city hall, the university founded in 1918, advanced schools and three theaters. The chief products are cloth, leather, agricultural implements, flour, soap and beer, and the trade is chiefly in wool and grain. In early times Lublin was an important commercial center dominating a large territory. In 1344 it was burned by the Tatars and burned again in 1477. Est. pop. 1930, 119,215.

LUBLIN, UNION OF. When Alexander of the House of Jagello in 1501 became both king of Poland and grand duke of Lithuania, the Union between these two regions, originally brought about in 1386, was made permanent. The Senates of both states agreed on this occasion that in future all kings of Poland were also to be recognized as rulers of Lithuania, though the union was to be merely a personal one. The Lithuanians were quite ready to make this arrangement through fear of Ivan III of Russia.

King Sigismund II, 1548-72, however, felt that the personal union was not strong enough in view of the continuing Russian peril, and accordingly suggested a complete amalgamation of his two domains. After some hesitation on the part of the Lithuanian magnates who feared loss of power and prestige in the event of an absolute merger, the Diet of Lublin, on July 1, 1569, unanimously agreed to the unification. Since the Ukraine was part of Lithuania at the time, this Union of Lublin enormously increased both the size and strength of the Kingdom of Poland. In 1825 an obelisk was erected in Lublin to commemorate the Union.

LUBRICATION, the introduction of a substance of low internal coefficient of FRICTION between surfaces which slide or roll over each other. The lubricant may vary through wide ranges, from thin oil for delicate, high-speed machinery to heavy grease for bearings or gears which carry heavy loads at slow speed. Graphite or black lead, mixed with oil or grease, is used as a lubricant in some cases. Talc, or soapstone, also comes under this head but is not recommended except in special cases. According to accepted theories, the lubricant, if in liquid form, forms a film which keeps the rubbing surfaces apart.

Methods of introducing lubricants between bearing surfaces vary widely, from the oil can to automatic devices that pump oil in metered amounts to each bearing in accordance with its needs. In some cases, oil is carried in a reservoir beneath the bearing and is fed to it by means of wicks. In others it is fed by gravity to the top of the revolving shaft, carried there by a ring riding on the shaft and dipping into an oil reservoir, or is drawn into the bearing by the shaft itself. Grease cups were originally receptacles to hold a hard grease which would run into the bearing when it got hot enough to melt the grease. This was followed by grease cups that forced the lubricant into the bearing as desired. This has been developed into the "grease-gun" system, of which *alemite* is the best example. Here grease is forced into the bearings at high pressure, through special nipples that fit the nozzle of the gun. This last system has the advantage of forcing out the old grease, together with any dirt which may have worked its way into the bearing, leaving fresh lubricant between the friction surfaces. There are, of course, many other special methods of lubrication in use. F. H. C.

LUCAN (39-65 A.D.), Latin epic poet, whose full name was Marcus Annaeus Lucanus, was born at Cordova, Spain, in 39 A.D. He was a nephew of Seneca the younger, and was educated at Rome. Nero made him quaestor; he was also augur under Nero. The latter became jealous of Lucan and forbade him to recite in public. In revenge, Lucan joined the Piso conspiracy against Nero's life. The plot was discovered and Lucan tried to save himself by giving evidence, but was condemned to death. To avoid this disgrace he committed suicide in 65 A.D. His epic, *Pharsalia,* describes the struggle between Caesar and Pompey.

LUCAS, EDWARD VERRALL (1868-), English writer, was born in Brighton, June 12, 1868. He was educated at University College, London, and entered journalism. He was successively on the staffs of the *London Globe,* the *Academy* and *Punch.* As an editor, essayist and writer of travel books, his achievements are notable. A quiet, sympathetic humor pervades his essays, and his powers of description make the records of his wanderings delightful. One of his outstanding achievements is his edition of the works of Charles and Mary Lamb (*see* LAMB, CHARLES). Among his books are *Old Lamps for New, The Open Road* and his *Wanderer* travel series.

LUCAS, FREDERIC AUGUSTUS (1852-1929), American scientist, was born at Plymouth, Mass., Mar. 25, 1852. At nineteen he became assistant in Ward's Natural Science establishment, Rochester. In 1882 he joined the staff of the United States National Museum of which he was curator in 1893-1904. He held the post of curator of the museum of the Brooklyn Institute of Arts and Sciences in 1904-11, and in 1911-23 was director of the American Museum of Natural History, New York City. He wrote numerous studies on the anatomy of birds, fossil vertebrates and museum methods. He died in Flushing, N.Y., Feb. 9, 1929.

LUCCA, a city in north central Italy, capital of the Italian province of the same name and seat of

an archbishopric. The city is surrounded by walls which serve as promenades and which are accessible through four gates. It has several churches dating from the Lombard period, but rebuilt in the 12th and 13th centuries, as San Frediano and San Michele. The 11th century cathedral of San Martino has a rich façade added in 1204. It contains sculptures by Jacope della Quercia and Matteo Civitali and a Madonna with saints by Fra Bartolommeo. Other paintings by the latter are in the Palazzo Provinciale, as well as several fine sculptures. The former Roman amphitheater is now occupied by the market-place. The ancient *Luca,* Lucca passed rapidly from one dynasty to another through the centuries, having been for a time a free city, and finally became a part of United Italy. The chief manufactures are silk and cotton goods, flannel and tape. There is also a State tobacco factory. Pop. 1931, 81,807.

LUCERNE, the name given in northern Europe, especially in Great Britain, and in some parts of the eastern United States and Canada, to the forage plant commonly known in America as ALFALFA.

LUCERNE or **LUZERN,** a city of Switzerland, capital of the canton of Lucerne and the center of the Swiss tourist industry, beautifully situated on the Lake of the Four Cantons with views of the Rigi and Pilatus mountains. It is still partially surrounded by medieval walls and towers and has ancient covered bridges. There are broad quais on the lake front, where the fine hotels and the Kursaal are situated. The old church, known as the Hofkirche, founded in the 8th century, was rebuilt after a fire and has interesting art treasures and arcades. *The Dying Lion,* carved on the side of a grotto, after a model by Thorwaldsen, as a memorial to the Swiss guards in the French Revolution, is an outstanding feature. The Glacier Garden, one of the finest remains of the ice age, is nearby. The old Rathaus, 1519-1605, and the quaint houses in the old part of the city are noteworthy, as is the War and Peace Museum. The city probably took its name from St. Leodegar, to whom the old church and abbey were dedicated. Pop. 1930, 47,208.

LUCERNE, LAKE, a lake of Switzerland, surrounded by the cantons of Schwyz, Uri, Unterwalden and Lucerne. The lake is 24 mi. long, about 2 mi. wide at its greatest expansion and comprises an area of 44 sq. mi. Its depth varies from 300 to 700 ft. The River Reuss enters the lake at its southeast and leaves it at the northwest extremity. Lake Lucerne is particularly noted for the beauty of its shores and the mountain landscapes which rise above its waters. The towns of Lucerne, Brunnen and Fluelen are on the shores.

LUCIA or **LUCY, ST.,** Christian martyr of Sicily, was born in the last quarter of the 3rd century in Sicily. She was one of the most famous of the victims during the persecutions of Diocletian. Born wealthy, she embraced Christianity, gave away all her riches to the poor, and refused to marry a noble youth who forthwith denounced her as a Christian. She bravely endured all the indignities that were heaped upon her and suffered martyrdom in 304. Her day is Dec. 13.

LUCIA DI LAMMERMOOR, an opera in three acts by GAETANO DONIZETTI, libretto based on Sir Walter Scott's *Bride of Lammermoor* by Salvatore Cammarano; première, Naples, 1835, London, 1838, Paris, 1839, New York, 1845. Of Donizetti's three score operas *Lucia* enjoys the widest favor. The work is melodious throughout; in the second act occurs the celebrated sextet, probably the most widely known ensemble number in Italian opera.

Lucia, sister of Lord Henry Ashton of Lammermoor, Scotland, is engaged to Sir Edgar of Ravenswood. In order to forward himself politically, Lord Henry wishes to see his sister married to Lord Arthur Bucklaw. Accordingly he persuades Lucia that her betrothed is unfaithful to her, and she, angered, agrees to marry Lord Arthur. Sir Edgar returns from France just as Lucia has signed the marriage contract with Lord Arthur. Persuaded that he has been foully betrayed by Lucia, he hurls at her feet the ring she gave him and calls down imprecations upon the house of Lammermoor. Lord Henry challenges him to a duel. Meanwhile the bride of Lammermoor, crazed with grief, dies after killing her husband. While waiting in the churchyard for Lord Henry, Sir Edgar witnesses the cortège of the fair Lucia; so he in turn ends his agony with a dagger.

LUCIAN (c. 120 A.D.-c. 200), Greek author, was born at Samosata in Syria, probably in 120 A.D. After an unsuccessful apprenticeship in sculpture, he went to Antioch, where he studied law and rhetoric. As a rhetorician he traveled extensively through Asia Minor, Greece, Italy, Spain, Gaul and other countries. When about 40 he began to devote himself almost exclusively to writing. Some 80 works attributed to him have come down to us. These cover a wide range of subjects, including rhetorical, biographical and critical writings, romances and satirical dialogues. The dialogues constitute the most important part of Lucian's works and place the author among the world's great satirists. Written in the finest of Greek prose, they display a penetrating wit and a fertility of imagination comparable to that of ERASMUS, RABELAIS and JONATHAN SWIFT, all of whom were deeply indebted to Lucian. In the latter years of his life, Lucian was given a post as procurator in Egypt, where he is believed to have died about the end of the 2nd century.

LUCIAN OF ANTIOCH, ST., scholar and Christian martyr, distinguished for his learning and eloquence, was born in Asia Minor in the 4th century. He refused to renounce Christianity and was put to death by Maximilian Galerius, probably in 312. A translation of the Old Testament into Greek is ascribed to him, and he has been much praised both by saints Jerome and Chrysostom. His day is Jan. 8.

LUCIFER (from the Greek for *light-bearer*), in Christian theology the name of Satan before his fall. Lucifer has been immortalized in Milton's *Paradise Lost.* The name was originally applied to the planet

Venus or the morning star and as such is referred to in the famous passage in Isaiah 14:12.

LUCILIUS, GAIUS (c. 180-103 B.C.), originator of the Roman satire, was born at Suessa Auruncum, Italy, about 180 B.C. He was an intimate friend of Scipio Africanus Minor, under whom he served at the siege of Numantia in 133. The invention of the poetical satire is generally credited to Lucilius, who gave it the form later developed by HORACE, PERSIUS and JUVENAL. His satires were characterized by a vigor and boldness of expression, but were often deficient in clarity. Fearless and severe, he assailed the political, literary and social world of his time, sparing no one, regardless of rank or power. Of his 30 books of satires bearing the general name *Satirae,* there remain about 1,100 fragments, consisting chiefly of unconnected lines. Lucilius is believed to have died at Naples in 103 B.C.

LUCIUS, name of three popes. St. Lucius I was Pope, 253-254. Lucius II, 1144-45, engaged in an unsuccessful campaign with Roger of Sicily. He was fatally wounded in attempting to suppress a rebellion. Lucius III, 1181-85, called the Council of Verona, 1184, where measures were adopted against heretics.

LUCKNOW, a city, district and division of India, on the right bank of the Gumti River, about 550 mi. northwest of Calcutta. It is a city of many handsome mosques and palaces, but its narrow streets have only in a few cases been widened, and the old houses are often unsightly. One of the most imposing structures is the Imambara, built by the 18th century ruler, Asaf-ud-Daula. Many parks and gardens are in the city, and in the European quarter rise large buildings of modern construction. Lucknow is the seat of the provincial law and governing bodies, Canning College and an important medical college. It is a leading railroad center and has large railroad shops. Manufactures include metal ware, muslins, pottery, and gold and silver brocade. In the SEPOY MUTINY, 1857, Lucknow was an important center of operations and was besieged by the mutineers (*see* LUCKNOW, RELIEF OF). Pop. 1931, 274,659.

LUCKNOW, RELIEF OF. During the INDIAN MUTINY, the inhabitants of Lucknow, a city in British India, were forced to seek refuge in the Residency and the entrenchments surrounding it, when it was besieged from July 1, to Nov. 19, 1857. On Sept. 19th, 3,179 British troops were sent to relieve Lucknow. They were successful in several encounters with the mutineers and arrived at the garrison on the 26th. During the next three weeks Sir Colin Campbell fought his way through with a column of soldiers, relieving the entire force on Nov. 19. It was not until Mar. 21, 1858, that the city itself was captured.

LUCRETIUS (TITUS LUCRETIUS CARUS) (c. 99-c. 55 B.C.), Roman poet, was born at Rome, about 99 B.C. Little is known of his life. St. Jerome, in his *Chronica Eusebii,* places his birth in 94 B.C., and adds that the poet was driven mad by a love potion, that he composed in the intervals of his insanity several books, which were revised by Cicero, and that he died by his own hand in his 44th year. Donatus, however, fixes 55 B.C. as the year of his death, and other sources make this date probable.

Lucretius left but one work, the *De Rerum Natura,* translated as *Of the Nature of Things,* a didactic epic in six books, composed in hexameter verse. The work expounds the Epicurean philosophy and the poet aims to free men from the baneful fear of gods. He endeavors to explain that the world of nature is governed by eternal, immutable laws, without the interference of supernatural powers, and lays down as fundamental the principles that nothing can come from nothing, and to nothing naught returns. The first elements of all existence are indestructible atoms moving in an infinite void (Book I). Book II deals with the movements, shapes and combinations of these atoms. In Book III it is stated that the soul is material and perishes with the body. Book IV discusses perceptions and sensations as mental processes. The origin of the world is treated in Book V, while Book VI explains such natural phenomena as lightning, thunder and the like. The *De Rerum Natura* ranks among the finest poems in Latin literature, and is perhaps the greatest didactic poem ever written.

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LUCULLUS, LUCIUS LICINIUS (c. 110-56 B.C.). Roman general. In the Social War, 90 B.C., a partisan of SULLA, he served as quaestor in Greece and Asia Minor under Sulla, 88-84 B.C. When Sulla on the conclusion of peace with MITHRIDATES returned to Rome, Lucullus remained in Asia where he completed financial reforms agreeable to the provincials but distasteful to the *publicani,* or tax-collectors. After holding the praetorship in Rome, 77 B.C., Lucullus returned to Asia, 74 B.C., to conduct military operations against Mithridates. During the next eight years Lucullus by brilliant generalship gained success after success. Unfortunately his army was not always well disposed to him, and the home government, impatient of more rapid and decisive results, at last, 66 B.C., decided to supersede him in command by Pompey. From this time forward Lucullus lived in luxurious ease, the patron of Greek men of letters, and the collector of a valuable library.

LUDENDORFF, ERICH VON (1865-), German soldier, was born at Kruszevnia, Posen, Apr. 9, 1865. He joined the army in 1883 and in 1894 was attached to the general staff. On the outbreak of the World War, Ludendorff was quartermaster-general of the II Army. He immediately gave evidence of his unquestioned military genius by capturing Liége and was then sent east as Hindenburg's chief-of-staff, where he dealt the Russians successive blows which liberated East Prussia and gave Germany access to Roumanian stores. In 1916 Ludendorff, as quartermaster-general under Hinderburg was sent to

the western front, where he launched a series of vigorous attacks in France and Flanders, 1917. Failing to separate the Allies, he made elaborate preparations for a great offensive in 1918. Vast bodies of troops and supplies were transferred from Russia, which had withdrawn from the war and in the Spring, the last desperate effort of the Germans to break through was begun. It lasted from April until July, when it was stopped by Foch's counter attacks which began the defeat of the Germans. After the Armistice Ludendorff retired, exhausted mentally and physically. In 1920 and 1923 he participated in two abortive attacks on the Republic. By many he is thought to have been the brains behind the strategy of the Germans in the World War.

LÜDENSCHEID, a Prussian city, in the province of Westphalia, about 37 mi. east of Düsseldorf. It manufactures chiefly miscellaneous metal goods. It belonged to the counts of Altena after 1200, later to the county of Mark, with which it fell to Brandenburg in the 17th century. Pop. 1925, 32,758.

LUDINGTON, a port city in western Michigan, second only in tonnage to Milwaukee on Lake Michigan, the county seat of Mason Co. It is situated at the mouth of the Pere Marquette River, 105 mi. northwest of Grand Rapids. An airport, bus and truck lines, lake steamers, car-ferries and the Pere Marquette Railroad serve the city. Fruit and truck crops are raised in the vicinity. Ludington has watch case, game board, canoe factories and a large salt plant. Pere Marquette, French explorer and missionary, died nearby in 1675; the vicinity was a favorite meeting place of the Indians. Ludington is in the center of a well-developed resort area. It was settled by lumber men in 1850 and incorporated in 1874. Pop. 1920, 8,810; 1930, 8,898.

LUDLOW, a municipal borough of Shropshire, England, situated on a wooded eminence at the junction of the Teme and Corve rivers, 162 mi. northwest of London. Traditionally of British origin, it is one of the Ludes of the Domesday Survey. Above it are the ruins of the 11th century castle where Milton's *Comus* was first produced and where Samuel Butler wrote his satiric *Hudibras* in 1660. The town is rich in ancient half-timbered and pargeted houses and inns, and here is the cruciform, Perpendicular parish Church of St. Lawrence. Once a famed market of Welsh woolens and smith's work, Ludlow to-day is a center for Hereford cattle, and has few interests unrelated to agriculture. Pop. 1921, 5,674; 1931, 5,642.

LUDLOW, a residential suburb of Cincinnati, O., situated on the southern bank of the Ohio River, in Kenton Co., northern Kentucky. The Southern railroad and river craft serve the city. Ludlow was founded in 1825, was incorporated in 1861 and became a fourth class city in 1892. Pop. 1920, 4,582; 1930, 6,485.

LUDLOW, a town of southwestern Massachusetts, in Hampden Co., situated on the Chicopee River about 8 mi. northeast of Springfield. It is on the Boston & Albany railroad. Among local industries is the manufacture of yarn, twine and cloth webbing. Ludlow has a well-equipped library and hospital, and several fine public buildings. Pop. 1920, 7,470; 1930, 8,876.

LUDLOW TYPECASTER, a machine combining hand composition with slug-line casting. Lines of matrices are composed by hand, and locked in a specially designed stick. From such lines the machine casts slug-lines similar to LINOTYPE slugs. The advantage, besides the creation of new type faces from which to print, is that slug composition can be handled expeditiously in make-up. Angular matrices for italics is a Ludlow feature entirely unique. The method permits of close fittings of italic characters, without resorting to the unsatisfactory expedient of kerns, in which the face of the type overhangs the body and is likely to be broken. E. W. P.

LUDWIG, EMIL (1881-), German author, was born in Breslau, Jan. 25, 1881, of Jewish parentage. In early life he studied and practiced law, but engaged in journalism and acted as a war correspondent during the World War. After producing some noteworthy novels and dramas, he found his true medium in biography. Ludwig's most popular works are *Goethe,* published 1920-23, *Bismarck,* 1922, *Napoleon,* 1924, *The Son of Man,* 1928, *Lincoln,* 1930, and *Schliemann,* 1931. Although his works lack careful biographical accuracy, Ludwig is accounted a master in the school of psychological biography.

LUDWIGSBURG, a German city in the state of Württemberg, located in the northwest, about 8 mi. north of Stuttgart. It is laid out regularly with streets intersecting at right angles and is built in the taste of the 17th century. The castle is large and sumptuous, surrounded by a park. In 1758-1824 a factory manufactured rare china under the auspices of Duke Karl Eugen. Present products are iron, metal and wire wares, woven goods, organs and pianos. Pop. 1925, 30,022

LUDWIGSHAFEN, a city in the Rhine-Palatinate of southwestern Germany, situated on the Rhine across the stream from Mannheim. The two cities together form a compact settlement of nearly 350,000 inhabitants. Ludwigshafen has large chemical, machine and textile factories. There is considerable trade in iron, lumber, coal and farm products, and the city has a large modern harbor. It is a fairly new manufacturing and commercial city, laid out in 1843; it owes its growth to industry and trade. Pop. 1925, 101,869.

LUFKIN, a city in eastern Texas, the county seat of Angelina Co. It is situated 115 mi. northeast of Houston and is served by bus lines and five railroads. The chief crops of the district are cotton, grain and fruit. Long and short leaf pine are abundant in this district, and lumbering is an important interest. The city has oil field machine shops, a wagon factory, lumber mills and various other industrial plants. Lufkin was founded in 1875 and became a city in 1890. Pop. 1920, 4,878; 1930, 7,311.

LUGANO, a city of Switzerland in the canton of Tessin, beautifully situated on the Lake of Lugano.

Around the city and on the terraced shore are many lovely villas. Among the most noteworthy buildings are the Church of St. Lawrence with a wonderful façade, and the Santa Marta and San Rocco churches. There is also a technical school, theological seminary and new theater. It produces furniture, chocolate and other articles, trades in wine and leather and holds large cattle fairs annually. It attracts large numbers of visitors on account of the mild climate. Pop. 1930, 15,269.

LUGANO (Italian *Lago Ceresio*), a small lake in Italy, 19 sq. mi. in area and in parts 945 ft deep. Its wooded banks, abrupt in places, are more severe than those of the sister lakes, but Lugano combines the charm of the Italian landscape with the grandeur of the Alps. It is one of the most frequented of the Alpine lakes. The banks belong to the Swiss canton Tessin and to the Italian province of Como. A local railway runs along the valley of the lake and there are steamers from Ponte Tresa to Lugano and from there to Porlezza. Cable trams ascend to vantage points where superb views are obtained.

LUGANSK, an important city near the eastern border of the Urkrainian S.S.R., situated on the Lugan, near its junction with the Donetz River, and in the midst of the Donetz Coal Basin. Vast deposits of anthracite and pit-coal led to the construction of an iron foundry in 1795 to supply artillery to southern forts and the Black Sea fleet. A large locomotive works and an enamel plant are the principal factories; two-thirds of the inhabitants, 50% of whom are Ukrainians, are farmers. It is the seat of the Donetz Institute for Public Instruction. Lugansk's modern development began with the introduction of the locomotive works in 1896. Pop. 1926, 71,756.

LUGGER. *See* BOAT.

LUGO, a city of northwestern Spain, capital of the province of the same name, in a fruitful region on the Mino. It is the seat of a bishop with a cathedral and advanced schools. There are sulphur springs nearby. The principal trade of Lugo is in woven goods, hats, cattle and leather which is tanned here. Est. pop. 1929, 29,000.

LUGONES, LEOPOLDO (1874-), one of the foremost writers of contemporary Argentina, was born June 13, 1874, in Rio Seco, Province of Cordoba. Here he received his primary education, from which he advanced to the Colegio Nacional. At 16 he was taken on to the staff of *El Interior,* Cordoba, which was edited by Dr. Figueroa Alcorta, later President of Argentina. In 1895 Lugones went to Buenos Aires to join the staff of *El Tiempo.* Two years later found him in the Postal and Telegraph service; from now on his advancement was rapid. He was quickly promoted to inspectorship, becoming then Chief Inspector, a post that he held until 1900. For the next 2 years he was Inspector of Secondary and Normal Education; from 1902 to 1904 he was Acting General Inspector. In 1906 Lugones made a tour of France, Germany, Sweden and Norway. In 1911 he was again in Paris. Three years later he founded *La Revue Sudamericaine,* but the World War came to wreck his project. He returned to Buenos Aires and engaged in a campaign against German Imperialism. In 1915 he was the Director of the National Library for Teachers and did much to expand the children's section. At this same time he joined the faculty of the University of La Plata, occupying a chair in Aesthetics.

Lugones, a man of extreme versatility, has written in almost all the literary forms. In much of his work he pays the penalty exacted by such a host of interests, and at bottom is far more important as a poet than as a thinker. His strong personality has continually involved him in polemics, centering especially about education and international relations. Even his poetry has been strongly attacked on the score of its originality, yet enough remains unquestionably his own to assure him a position as one of the great forces in the literature of Modernism and its later ramifications. Among his most important collections of verse are *Las Montanas del oro,* 1897, notable for its free verse and its rebellious spirit; *Los crepusculos del jardin,* 1905, in which he reveals the delicate facet of his personality; *Lunario sentimental,* 1909; *Odas seculares,* 1911; *El libro fiel,* 1915; and *El libro de los paisajes.* Lugones's collections of poetry are interesting for their evidence as to the striking manner in which he assimilates the most diverse influences. I. G.

LUISENO, a Californian Indian group, the southernmost in that state speaking a dialect of the Shoshonean linguistic stock. With the Aguas Calientes, Juanenos and Kawia they form a single language group. They lived along the coast between San Onofre and Las Animas Creeks and inland to the north of the San Jacinto River. Their dress was typical, consisting of nothing for men, a back and front apron for women and long capes or robes for both sexes in cold weather. Houses were built over a two foot excavation and were earth-covered. Food consisted primarily of seeds, plant foliage and certain animals, also grasshoppers during the wingless state and probably snakes.

LUKE, ST., author of the GOSPEL OF ST. LUKE and of the BOOK OF ACTS, was probably of non-Jewish origin and was a companion of ST. PAUL when he was in Rome. His name suggests that he was of Italian origin, and internal evidence seems to indicate that he practiced the profession of medicine in Antioch. He accompanied St. Paul on the latter's second great missionary enterprise, and apparently wrote his great works towards the end of his life. A possibly authentic tradition is that St. Luke died in Bithynia at the age of 74. This would seem to indicate that the Gospel of St. Luke was written between 80-90 A.D. St. Luke's work is generally appraised as the highest expression of literary art, and the writings would serve to indicate a very remarkable personality. Luke is best remembered in St. Paul's characterization as "the physician, the be-

loved physician." The centuries have accumulated many legends around the name of St. Luke. Especially noteworthy in this connection is the attribution to him of a painted portrait of the Virgin Mother



THE COW OF ST. LUKE, THE SYMBOL IN ART OF THAT SAINT
From an engraving by Martin Schongauer

first mentioned in an obscure 6th century manuscript.

LUKE, GOSPEL OF ST., the third Gospel in the New Testament and the last of the synoptic Gospels, is traditionally ascribed to the Luke who was a companion of the Apostle Paul, and who is described in the EPISTLE TO THE COLOSSIANS as "the beloved physician." The Gospel is sometimes termed The Gospel of St. Paul, not without reason, due to the association of the Apostle with Luke. More than the other synoptic Gospels it bears Paul's emphasis on a message of good news for all nations. Its date is a matter of dispute, some favoring 63 A.D., before the destruction of Jerusalem; others, 80 A.D., representing modern opinion. There is no evidence as to where the Gospel was written; but its style suggests some Hellenic center, for it is not only written in purer Greek than the other Gospels, but was apparently written for Greeks by an educated observer, as a physician might well be. It is confessedly a history: "it seemed good to me, having traced all things accurately from the first, to write unto thee in order that thou mightest know." Eighteen of the parables and six of the miracles found in Luke are not recorded by any of the other Gospels, so that much of the teaching and the life of Jesus, we owe to this Gospel only. The most famous of the Luke parables is the story of the prodigal son, which has become one of the classics of the Christian church. It is to the physician-evangelist also that we owe the preservation of the beautiful invitation of Jesus to the young, "Suffer the little children to come unto Me, and forbid them not, for of such is the Kingdom of God."

LUKS, GEORGE BENJAMIN (1867-), American painter, was born at Williamsport, Pa., Aug. 13, 1867. He studied in Philadelphia, Düsseldorf, Paris and London. In 1895-96 he was war correspondent and artist for *The Philadelphia Bulletin* in Cuba. Luks is noted for his portraits and figure compositions. He is represented in the Metropolitan Museum, New York; Cleveland Museum; Phillips Memorial Gallery, Washington; and elsewhere in America; also by murals in the Neco Allen Hotel, Pottsville, Pa.

LULE BURGAS, BATTLE OF, a major engagement in the BALKAN WARS. The battle occurred during Oct. 28-30, 1912, between the Turks, entrenched on a 20-mile front extending north and south between Bunar-Hissar and Lule Burgas, in European Turkey, and the 1st and 3rd Bulgarian armies. After three days of fighting the Turkish right collapsed, and Nazim Pasha, the Turkish commander, ordered a withdrawal south to the Chatalja entrenchments northwest of Constantinople.

LULING, a city in Caldwell Co., south central Texas. It is situated 44 mi. south of Austin and is served by two railroads and bus lines. The city lies in a fertile agricultural region; cattle ranching, dairying and poultry-raising are the chief interests. Oil industries, refineries, tank farms and a $1,000,000 Foundation Farm are important features of the city and the vicinity. Pop. 1920, 1,502; 1930, 5,970.

LULLY, JEAN BAPTISTE DE (1632-87), Italian music composer, known also as Lulli, was born at Florence, Nov. 29, 1632. Despite his Italian birth and ancestry he is often called French, because he went to France at the age of 13 and in 1661 applied for naturalization papers. He was a great favorite of Louis XIV, in 1652 being appointed conductor of the royal orchestra, and thereafter composing innumerable masques and ballets in which the monarch himself participated. In 1672 he established the Academie Royale de Musique, forerunner of the present Opéra, over which he assumed complete control. Aided only by his librettist, Quinault, he produced a score of works that may be said to have founded the art of French opera. Although his operas are seldom heard to-day, they held the stage for a century and were abandoned only when the work of GLUCK and his successors brought forth a more pronounced dramatic accent. Among his memorable labors are *Armide et Renaud, Alceste, Atys, Isis, Phaéton, Roland,* and *Acis et Galatée.* He died at Paris, Mar. 22, 1687.

LUMBAGO, inflammation of the sheaths and attachments of the muscles of the lumbar region. It is likely to attack middle aged persons who do not take sufficient exercise. Lumbago is first noticed as a sharp pain during a movement. At every contraction of the affected muscles there is a dart of pain. The patient should be placed at rest and the bowels opened by a cathartic. Heat applied to the back, especially radiant heat, is effective, as well as immobilization of the back muscles by bandaging or special corsets.

LUMBER INDUSTRY. Lumbering or the production of timber products, covers the operations of logging camps, sawmills, planing mills, veneer mills and cooperage stock mills.

The principal products of logging camps include saw logs of various lengths; stave, shingle and head-

ing bolts; poles; mine timbers; ship masts; railway ties; fence posts; wheel and handle stocks; excelsior stock and pulpwood. The products of sawmills include rough lumber, shingles, lath, sawed railway ties, and stock for cooperage, spool, pencil, penholder and veneer manufacture. Planing mills produce dressed, that is, smooth lumber: sash, doors, blinds, interior woodwork and molding.

Most veneer is rotary cut, though some is sliced and sawed. The variety of wood and the purpose for which it is to be used determines the method of cutting. Cooperage stock mills turn out tight and slack staves, head and wooden hoops. Tight cooperage stock is used in containers for liquids, and slack stock in the manufacture of containers for solids.

It will be noted that practically all the products of the lumber industry are used as raw materials by manufactures in other industries, as, for example, furniture manufacturing or the making of wooden boxes.

The logging industry of the United States was first concentrated in the New England states, then moved southwest through New York and Pennsylvania. During the last third of the 19th century, the vast pine forests of Michigan and Minnesota were cut over and though at the time many lumbermen claimed that these forests were inexhaustible, the opening of the 20th century saw the lumber camps moving to the south and the northwest. Fully half of the marketable timber still standing in the United States is in the northwest.

While a certain amount of the timber cut to-day in the United States is felled on farms and used either in building, fencing, etc., or for firewood, at least 75% of all timber cut and 90% of all first quality timber is taken from virgin forests. Less than one-sixth of the virgin timber of the country still remains uncut (*see* FORESTRY). The annual cut amounts to around 35 billion board feet.

In logging virgin timber, the first step is to "estimate" or "look over" the tract of land to be logged. Much such timberland has been only roughly surveyed and the first task of the "timber estimator," also called land-looker or scaler, is to divide the land accurately into sections, half sections and quarter sections. A map is usually divided into plots of 40 acres, and on each "forty" the estimator notes the amount of lumber he thinks can be cut. Often routes for logging roads, camp sites and dam sites are located at the same time.

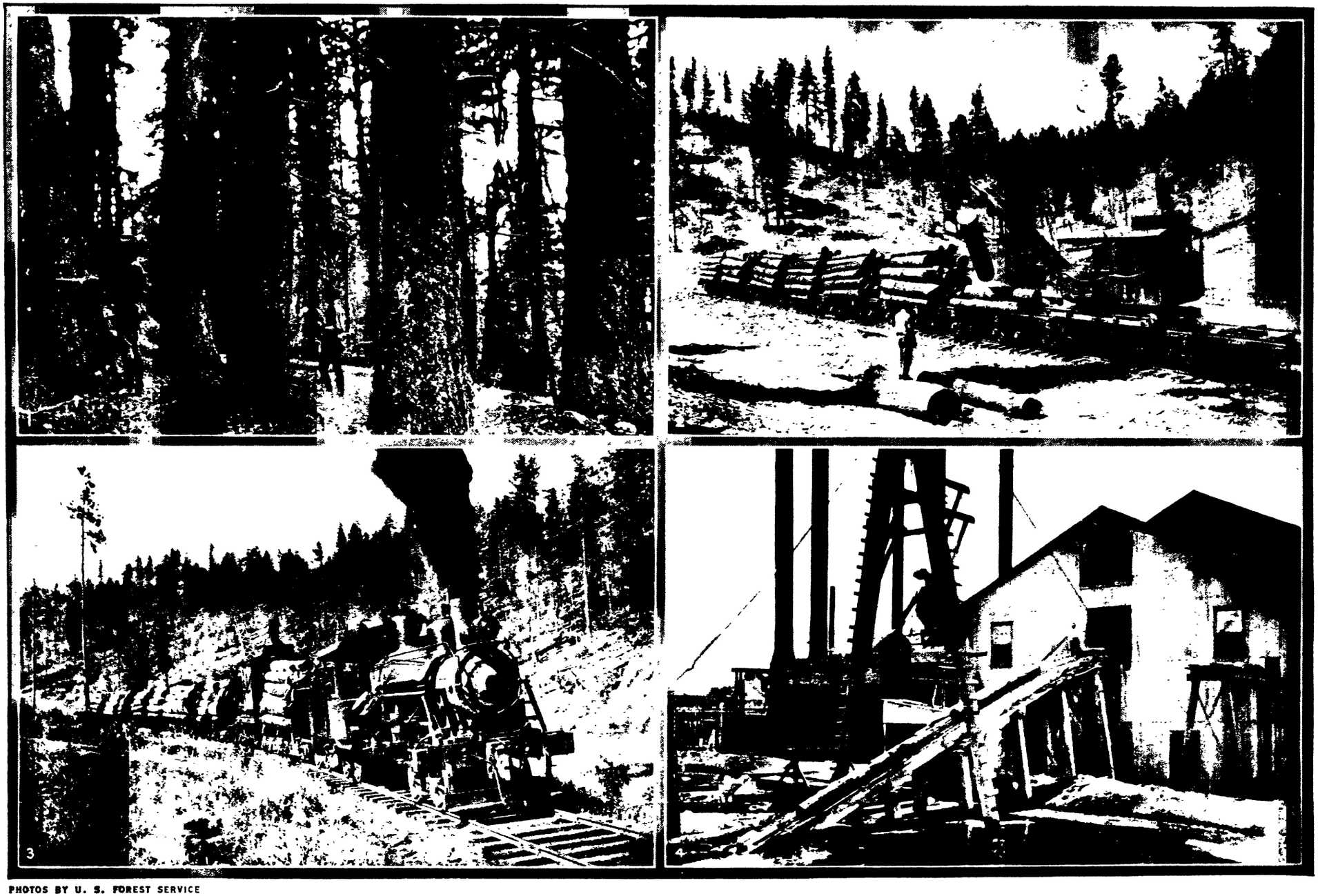
Methods of logging differ greatly in various sections of the country. In the northeast and north midwest, saw logs are still dragged to river banks by horses, rolled into the stream when the ice breaks and floated down to sawmills on the spring floods. However, the rapidity of the current, the difficulty of the "drive" and the loss by jams and subsequent dynamiting have combined to minimize the use of natural water power. In the south and northwest, the great production centers to-day, most of the handling is done by machinery. Trees are notched by axe men, felled and cut into suitable lengths by sawing. These logs, gripped in a huge pair of steel tongs, are pulled by a steel cable to a point where they may be loaded onto motor trucks or logging trains. Power is provided by donkey engines, usually burning waste wood. In the northwest much electricity, generated by waterpower, is used. Many operations employ the overhead cable, and logs suspended from this are pulled from the spot where the tree was felled to the loading point. Logging trains may run on either regular or narrow gauge track, the track being puled up and re-laid as cutting progresses. Logging trains also carry logs from the place of cutting to seaports from which they are rafted or to sawmills in towns at considerable distance from the forested mountain.

In the northwest, because of the enormous size of the logs, almost all timber is transported from the woods on logging trains. Flumes, long troughs running often for many miles down mountainsides and containing water diverted from a mountain stream, are a novel feature of logging in this section. The rafting of saw logs is an important element of lumbering on the northwest coast. While a certain amount of rafting was and still is done on the northern shores of the Great Lakes, the huge sea-going rafts of the Pacific coast are unique. These rafts, consisting of several millions of feet of saw logs bound together with chains or steel cables, are towed by tugs from docks in Oregon and Washington to sawmills in California.

U.S. LUMBER PRODUCTION, 1930.

	Total Cut, M Board Feet	*% of Total*	*Principal Wood Cut*
UNITED STATES	26,051,403	100.0	Yellow Pine, Douglas Fir
Leading States:—			
Washington	5,502,129	21.2	Douglas Fir
Oregon	3,654,075	14.1	Douglas Fir
Louisiana	1,606,718	6.2	Yellow Pine
California	1,514,263	5.8	Western Yellow Pine
Mississippi	1,484,378	5.7	Yellow Pine
Alabama	1,341,624	5.1	"
Texas	1,045,262	4.0	"
Florida	876,039	3.4	Cypress
Arkansas	869,379	3.3	Yellow Pine
Idaho	840,409	3.2	White Pine
North Carolina	814,835	3.1	Yellow Pine
Georgia	753,484	2.9	"

The last century has seen great changes in methods of sawing logs. In both Europe and North America, the saw pit was in use until the last of the 18th century. Circular saws were first used in England in 1777, but not in the United States until considerably later. Removable saw teeth were invented by an American, William Kendall, in 1826. Curiously, while the efficient band saw was invented in 1808, it was not used until 1872, when it was applied to cutting hardwood at an Ohio mill.



PHOTOS BY U. S. FOREST SERVICE

STEPS IN THE PREPARATION OF LUMBER

1. Inspecting lumber preparatory to cutting. **2.** A steam loader at work.
3. A loaded logging train leaving the forest. **4.** Logs entering a saw mill.



1. COURTESY U. S. FOREST SERVICE; 2, 3, 4. CATERPILLAR TRACTOR CO.

VIEWS OF LOGGING OPERATIONS

1. Moving logs by wooden slide and horses. Boy supplying grease. **2.** Dragging giant California redwood log to railway with tractor. **3.** Preparing to drag a huge redwood log to the railroad. Scene near Eureka, California. **4.** Caterpillar tractor skidding logs into position for loading by hoist.

LUMBER PRODUCTION, U.S.,

KINDS OF TIMBER CUT, 1928-30

Kind of Wood	*Quantity, M Feet, Board Measure*		
	1928	*1929*	*1930*
Birch	337,550	374,377	284,465
Cedar	266,774	308,839	237,861
Cypress	501,422	532,022	490,857
Douglas Fir	8,449,298	8,688,700	6,453,043
Hemlock	2,221,756	2,098,668	1,517,370
Maple	742,642	823,552	601,218
Oak	1,830,260	2,574,495	1,661,691
Red Gum	967,756	1,103,703	694,480
Redwood	486,827	485,606	403,072
Spruce	571,917	563,953	442,428
Tupelo	316,554	306,634	254,386
Western Yellow Pine	2,975,732	3,288,237	2,594,454
White Pine	1,366,933	1,247,878	1,108,740
Yellow Pine	10,610,290	11,629,689	7,450,238
Yellow Poplar	327,833	435,953	257,803
Other	2,168,579	2,423,726	1,599,367
Total	34,142,123	36,886,032	26,051,473

AGGREGATE LUMBER CUT, 1930,

U.S. AND LEADING STATES

Hardwood Cut		*Softwood Cut*	
State	*M Feet, B.M.*	*State*	*M Feet, B.M.*
Arkansas	299,695	Alabama	1,341,624
Louisiana	549,245	California	1,514,263
Michigan	359,119	Florida	876,039
Mississippi	357,205	Louisiana	1,606,718
Tennessee	337,414	Mississippi	1,484,378
Virginia	202,880	Oregon	3,654,075
West Virginia	319,881	Texas	1,045,262
Wisconsin	378,236	Washington	5,502,129

The chief lumber producing countries are the United States, British America, Russia, Sweden, Germany and France, though the tropics produce many beautiful woods used in furniture making and cabinetwork. Probably the supply of these tropical hardwoods will always be sufficient to fill the demand, but world reserves of soft woods are rapidly decreasing and the time when there will be a shortage is already in sight. Considerable reforestation has been done in Germany and a certain amount in some sections of the United States. A. R. F.

LUMEN. *See* PHOTOMETRY; ILLUMINATION, ARTIFICIAL.

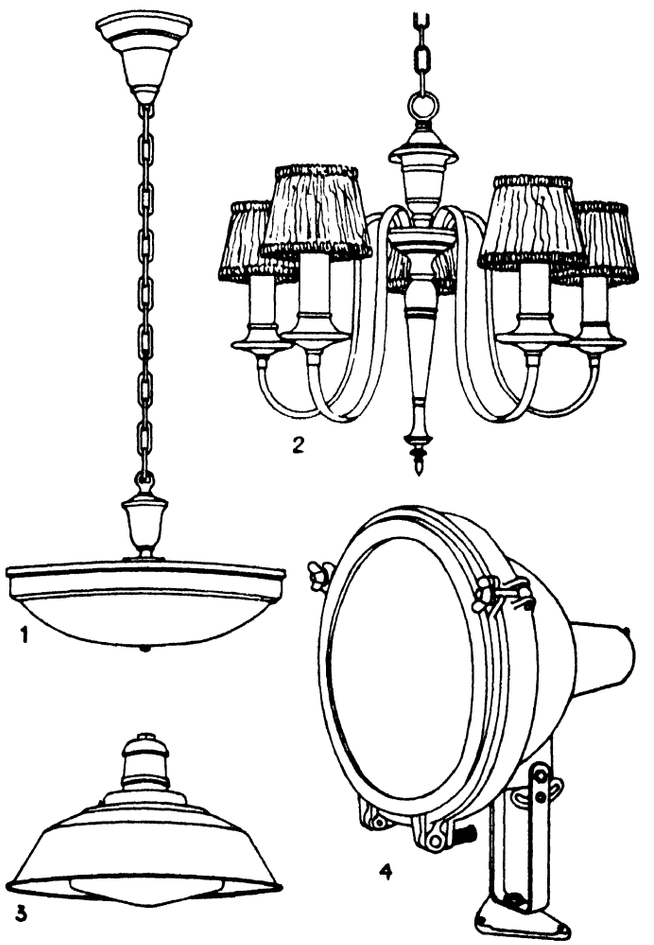
LUMIA, called the eighth fine art, the use of light projected in rhythmically changing form, motion and color on a white screen, for the purpose of esthetic expression, by means of a keyboard-equipped projection instrument played by a skilled artist. Development has been retarded by many fruitless attempts to establish a definite analogy between light and sound vibrations and to make Lumia subservient to music in disregard of physical laws and basic differences between eye and ear as receptors of esthetic impressions.

Its purest form is the silent performance of abstract visual composition in motion and its closest sister-art therefore the dance. Early experiments by L. B. Castel (b. 1688), B. Bishop, A. W. Rimington (b. 1854) and recently by A. B. Klein, A. Hector and M. Luckiesh. Lumia was given its name by Thomas Wilfred, inventor of the CLAVILUX, whose theory that form, motion and color are its basic factors gave the new art its first independent status. Silent visual recitals were successfully played on the clavilux in New York, 1919.

Lumia has been used in conjunction with drama, dance and music, but in such combinations the visual artist must be given all the freedom now granted a composer creating a musical setting for a poem or libretto. T. W.

BIBLIOGRAPHY.—A. B. Klein, *Colour Music,* 1926.

LUMINAIRE, a complete lighting unit, popularly known as a fixture. It consists of a light source and its direct appurtenances, such as globe, reflector, refractor, housing and such support as is integral with the housing. The primary function of a luminaire is to shield, diffuse or project the rays of a light source. Popular types of luminaires include enclosing opal glass globes for commercial use, metal reflectors for industrial establishments, lighting fixtures for the home and floodlights for exterior applications. See illustrations.



COURTESY WESTINGHOUSE LAMP CO

TYPES OF ELECTRICAL FIXTURES

1, *Indirect fixture;* 2, *candlestick chandelier;* 3, *glasteel diffuser;* 4, *floodlight projector*

LUMINESCENCE. *See* FLUORESCENT SPECTRUM.

LUMINISM, a term applied to the *plein air* section of the Impressionistic School made up of those whose interest was focused on the problem of full sunlight in landscape painting. Followers and developers of the methods of EDOUARD MANET in handling light and color, Monet, Pisarro, Sisley, Renoir, Cézanne and others were known as "luminists" or "vibratists." About 1870 CLAUDE MONET, while in England, fell under the influence of Turner and Constable. He returned to France to give the remaining years of his life to studies in outdoor landscape painting. His *Cathedrals* are six pictures of Rouen Cathedral taken from the same point of observation but at different seasons or hours of the day. Impressionism owes its chief debt to him for working out its methods in detail, although others, notably Pissarro and Cézanne, obtained more masterly results from them. Through sheer technique a luminism or radiance was imparted to foliage that made a whole picture seem aglow, an effect heretofore considered possible only to the genius of great masters. The discovery by Manet and Degas of Japanese prints had a strong influence on the movement from the point of view of perspective, special space composition and flatness of color tones. (*See* IMPRESSIONISM). Objects became but shimmering reflectors of iridescent color as seen through the medium of a visible atmosphere, reflecting and refracting direct light passing through the vibrating ether. "Divisionism," as used by many of the great landscape painters, was emphasized. Pure color, intermingled with points of white, was placed in tiny spots side by side in strong contrast. These points or patches of broken color not only act and react upon each, but at the proper distance are blended together by the eye, causing a luminous or vibrant effect. Luminism has found its proper place in landscape painting as a means of presenting the changing moods of nature.

LUMINOUS PAINT, a compound possessing the ability to absorb light and emit it later, as in darkness. Such paints are usually made from calcium sulphate mixed with mastic varnish. In another process oyster shells are utilized for their calcium content. More recent methods employ sulphates of calcium, barium or strontium. More luminous but more expensive colors can be obtained by using calcium oxide, barium carbonate or sulphate of strontium. Luminous paints, used extensively on watch and clock dials, are made from radio-active substances, and require no exposure to light in order to exhibit luminosity.

LUMMI, a North American Indian tribe speaking the SONGISH dialect of the Salishan linguistic stock. They lived at and near Bellingham Bay in northwestern Washington and formerly occupied also the islands east of Vancouver Island. About 500 now live on a Reservation of the same name in Washington, though mainly on allotted lands.

LUMMIS, CHARLES FLETCHER (1859-1928), American author, was born in Lynn, Mass., Mar. 1, 1859, and educated at Harvard University. In 1885-87 he was city editor of the Los Angeles *Daily Times.* Subsequently he traveled on horseback through the southwest and lived several years among the Indians of New Mexico. His writings are mostly based on the history and folklore of this locality. He edited the *Out West Magazine* from 1894-1909, and founded the Southwest Museum to which he gave his rare collection of Spanish-Americana. Among his books are several collections of old Spanish and Indian songs. Lummis died in Los Angeles, Cal., Nov. 25, 1928.

LUMP-JAW. *See* ACTINOMYCOSIS.

LUMPSUCKER or **LUMPFISH,** a marine mail-cheeked fish (*Cyclopterus lumpus*) of odd appearance, somewhat allied to the sculpins, found along both coasts of the North Atlantic. Its short, thick, soft body, sometimes 20 in. long, is provided with a sucker-like disk formed by the united ventral fins. The smooth dull olive-colored skin is more or less beset with large tubercles. Clumsy and very slow in habit, the lumpsucker lives chiefly on the sea bottom along shores where it clings to rocks by means of its sucking disk, feeding largely on small invertebrates.

LUMPY JAW. *See* ACTINOMYCOSIS.

LUNA or **NOCTILUCA,** in Roman mythology, goddess of the moon. She is identified with the Greek SELENE.

LUNACHARSKY, ANATOLY VASILIEVICH (1875-), Russian politician, author and dramatist, was born at Poltawa, Nov. 24, 1875. He was interested in natural science and economics, and was twice imprisoned for his revolutionary activities and revolutionary writings. Following the November Revolution in 1917 he became People's Commissar for Public Instruction. Among Lunacharsky's interests have been education for the masses and the development of the Russian stage. He has written a number of plays and several books on politics, economics, art and literature.

LUNACY, a term in practice substantially synonymous with insanity. At common law lunatics were taken to be under the protection of the King as father of his country, and the Court of Chancery would appoint a committee or guardian. Lunacy may affect capacity for rights, capacity for legal transactions, or capacity to commit wrongs. In the common law a lunatic has capacity for rights. As to capacity for legal transactions, since legal transactions depend upon will, a person so diseased mentally as to be incapable of exerting a will is incapable of entering into a valid legal transaction. But even if will is present, judgment may be so impaired that it is inequitable to give effect to the transaction. In such case it may be voided or set aside, and in the case of a last will where a disposing mind is an element of validity, the instrument will fail. As to capacity to commit wrongs, at common law the lunatic is held for his torts, that is, his property must answer for mischief which he does. In criminal law, theoretically, insanity may affect the act element of a crime since an act is an exertion of the will in the external world,

and the mental disease may be such that the accused is incapable of exerting a will. On the other hand, it may effect the element of criminal intent, since the accused may not be capable of understanding the nature and quality of his act and distinguishing between right and wrong. England, and a majority of the states of the United States consider only this feature of criminal responsibility of the insane. A number of states take into account the will element also by holding that there is no responsibility where the accused acts, as it is said, under an irresistible impulse. *See also* INSANITY.

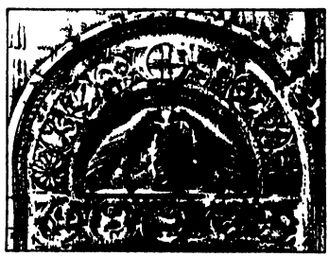
LUNA MOTH, a large and very beautiful species (*Tropæa luna*) of the family *Saturniidæ*. Wings of the adult are a delicate light green in color, with a purple-brown band on the front margin of the fore wing. An eye-spot is present in each wing. The inner margins of the hind wings are prolonged into long tail-like processes. Caterpillars are pale bluish-green in color. When mature, they may measure 3 in. in length. Food plants include walnut, hickory and other forest trees. Cocoons are of thin silk, usually enclosed in a leaf.

LUNDY, an English island, near the north coast of Devonshire, 9 mi. from Hartland Point. It is 3 mi. long, has an average breadth of ½ mi. and a total area of about 1,100 acres. The coast is rocky and picturesque. Lundy was once a stronghold of pirates, Turkish and Spanish pirates having captured the island in the 17th century. At one time it was a retreat for French privateers. There are only about 50 inhabitants and little of the land is under cultivation.

LUNDY'S LANE, BATTLE OF, July 25, 1814, a bitter engagement of the WAR OF 1812. Shortly after the BATTLE OF CHIPPEWA Gen. Drummond arrived from Kingston with 800 troops, bringing the British strength on the Niagara to 3,000 men. Advised that the British were again moving against the American army at Chippewa, but doubting the authenticity of the intelligence, Gen. Brown dispatched Gen. Scott with 1,200 troops. The American troops marched squarely into the bowl of a crescent of British troops stretched from the Queenston Road to Lundy's Lane, near the great cataract of Niagara. The battle began at sunset; at nine Brown with the remaining 800 troops of the American army arrived to reinforce Scott. After five hours of fierce fighting, in the course of which Generals Drummond and Riall, commanding the British, and Generals Brown and Scott were wounded, the American army withdrew to Chippewa. The British loss was 879 men; the American, 833.

LÜNEBURG, a Prussian city in the province of Hanover, located on the Ilmenau River and about 30 mi. southwest of Hamburg. It was once the capital of the principality of Lüneburg and was a Hanseatic city. There are numerous ancient houses in the center, but the suburbs, with fine gardens, give a modern aspect. Besides the private houses, there are many public buildings in late-Gothic and Renaissance style which bear witness to its splendor in the 14th, 15th and 16th centuries. St. John's Church, 14th century, is in the purest Gothic style, St. Michael's, 15th century, has the tombs of the Lüneburg princes, and St. Nicholas's Church of the 15th century has a splendid nave and high tower. The old rathaus, with its great hall, ancient portraits, stained glass and carvings, is noteworthy. Besides the salt works, used as early as 906, there are iron, chemical and cement works, a number of minor industries, and trade in wine, wool, lumber and wax. The city is a spa well-known for its brine and peat baths. The city declined greatly after the Thirty Years' War, but started to flourish again in the middle of the 19th century. Pop. 1925, 28,899.

LUNETTE, in architecture, the semicircular form under an arch or vault, especially where this space is filled with a wall or partition. In Romanesque and Gothic work a lunette over an important door, when filled with masonry, is called a Tympanum. Lunettes have been favorite spaces for rich decoration in color or relief ever since the beginning of the Renaissance.



12TH CENTURY LUNETTE ABOVE PORTAL OF CATHEDRAL OF S. RUFINO, ASSISI

OF, Feb. 9, 1801, a treaty between France and Austria as a result of Napoleon's brilliant campaign in north Italy in 1800 and Moreau's victory at Hohenlinden Dec. 3, 1800. The Emperor Francis agreed to the cession of the left bank of the Rhine to France; indemnification to be found in Germany for the dispossessed princes; recognition of the Batavian, Helvetian, Cisalpine and Ligurian republics set up by France; cession of Tuscany to Parma, and the recognition of all cessions between the two Powers in the Peace of Campo Formio. The Peace of Lunéville marks the end, for all practical purposes, of the Holy Roman Empire.

LUNGCHOW, a treaty port of Kwangsi province, China. It lies near the Tonkin frontier and is built on the banks of the Tso River above Nanking. The trade is small but the city serves as the gate by which products of the province pass into Indo-China. Kwangsi is rich in gold, silver and other metals. Pop. 1929, 14,731.

LUNGE, GEORG (1839-1923), German chemist, was born at Breslau, Sept. 15, 1839. In 1876 he became professor at Zurich, where he made valuable studies in technological chemistry, publishing a number of reports of great use in the organic chemical industries. He died at Zurich, Jan. 3, 1923.

LUNGFISH (*Dipneusta*), a group of fish equipped with air-bladders, used for breathing in addition to the gills. They are found to-day mainly in the rivers of Africa, New Zealand, and South America, though in Paleozoic times they formed a larger order. Two mudfish (*Protopterus* of Africa and *Lepidosiren* of South America), members of the lungfish family, inhabit sluggish, muddy streams and swamps. Their

small gills are not sufficient for respiration and the fish have to come to the surface to take air, inhaling it through the mouth. They feed heavily during the rainy season, storing up enough fat to last them through the period when the swamps dry up. Then they sleep in mud burrows of their own making,



AUSTRALIAN LUNGFISH

equipped with openings to permit the entrance of air. The entrance of these burrows is closed with a mud plug, which the fish pushes aside as it emerges. The eggs are laid in underground passages about 2 ft. long and 8 in. wide, and are guarded by the male until they hatch. Another lungfish is the barramunda (*Neoceratodus*) of Queensland, which attains a length of 6 ft. It rises to the surface to breathe air, remaining under water until the air is deoxygenized.

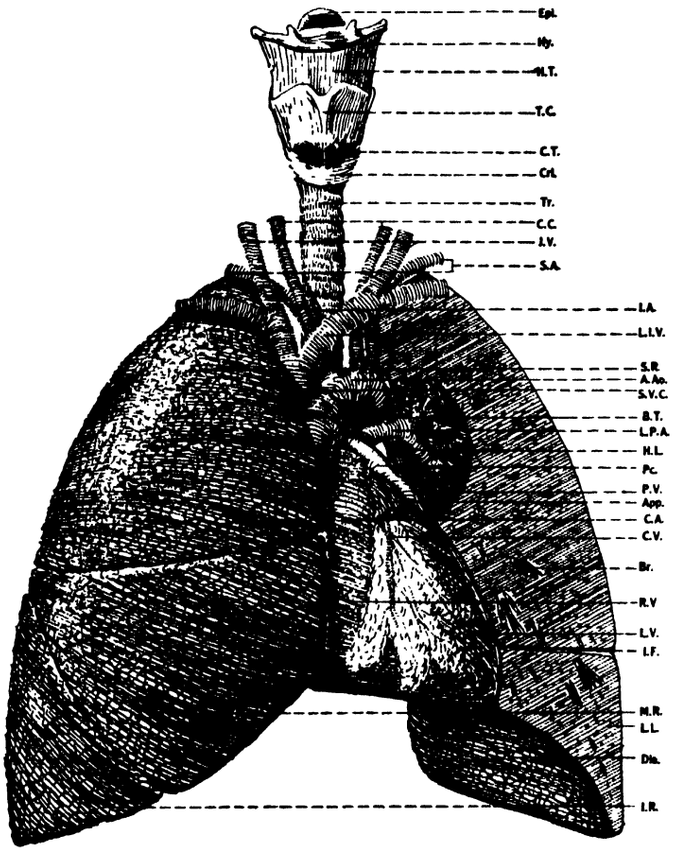
LUNGS, organs which serve in all the air-breathing vertebrates to bring the air and blood together, so that the air can give up oxygen to the blood and receive carbon dioxide from it.

The lungs are two in number and lie in the thoracic cavity, one on either side of the median partition. They are very elastic and tend to contract, but they are always distended by the air pressure, 15 pounds per square inch, so they are forced by it to expand when the cavity enlarges and they contract when the cavity gets smaller. This produces inspiration and expiration. Each one contains over three million little air sacs called alveoli. The bronchi terminate in them, and many are on the side walls of the finer air tubes.

Into the root of each lung go the arteries, and the veins come out. The walls of the alveoli are the site of exchange between blood and air. The outer surface of each is covered by capillaries. The inner surface next the air is constituted by a layer so thin that anatomists are uncertain of its nature—a delicate network of elastic connective tissue fibers with a few flat plaques, whether cellular or not is uncertain. A layer of fluid lines it next the air, fluid which dissolves both oxygen and carbon dioxide with great facility and passes it constantly across from one side to the other. Any dust particles or bacteria that come in with the air are removed by cilia which sweep them toward the mouth, if deposited on the walls of the tubes, or by phagocytic scavenger cells which engulf them, if they get all the way through to alveoli. (*See also* EXCRETION.)

Air is renewed by respiratory movements, 17 per minute when the body is quiet, but automatically speeded up even to 70 or 80 times a minute when the need for air is very great as during severe muscular effort or in pneumonia.

The right lung has three lobes, the left, two. They are separated by fissures which dip in from the surface almost to the root of each. They facilitate expansion of different lobes in different directions, and accommodate themselves to the size and position of the heart. When the lung contracts, the diaphragm,



THE HUMAN LUNGS, HEART, AND GREAT VESSELS SEEN ANTERIORLY, WITH THE FORWARD HALF OF THE LEFT LUNG REMOVED

A.Ao., *Arch of aorta;* App., *appendix of left atrium (auricle);* Br., *bronchiole;* B.T., *bifurcation of trachea into bronchi;* C.A., *conus arteriosus;* C.C., *common carotid arteries;* Cri., *cricoid cartilage;* C.T., *cricothyroideus muscle;* C.V., *coronary vessels;* Dia., *diaphragmatic surface of left lung;* Epi., *epiglottis;* H.L., *hilus of left lung;* H.T., *hyo-thyroid membrane;* Hy., *hyoid bone;* I.A., *innominate artery;* I.F., *interlobular fissure;* I.R., *inferior lobe of right lung;* J.V., *jugular veins;* L.I.V., *left innominate veins;* L.L. *lower lobe of left lung;* L.P.A., *left pulmonary artery;* L.V., *left ventricle;* M.R., *middle lobe of right lung;* Pc., *pericardium (cut);* P.V., *left pulmonary vein;* R.V., *right ventricle;* S.A., *subclavian arteries;* S.R., *superior lobe of right lung;* S.V.C., *superior vena cava;* T.C., *thyroid cartilage;* Tr., *trachea*

which is dome-shaped in rest, becomes a cone, and the lung margins are forced by air pressure to descend around it. *See also* RESPIRATION; RESPIRATORY APPARATUS. B. C. H. H.

LUPINE, the common name for a numerous genus (*Lupinus*) of herbs and subshrubs of the pea family. There are upwards of 300 species found in Europe, Africa and North America. More than 125 species grow in North America, chiefly in the western states; about 65 are native to California. Many species are prized as garden ornamentals or are cultivated for fodder and soil improvement. They are annuals or perennials, rarely slightly woody, with usually upright stems bearing digitate leaves of few to many narrow leaflets and conspicuous pealike flowers, of a wide range of color, in terminal clusters. In Greece and Egypt the white lupine (*L. albus*) and the Egyptian lupine (*L. Termis*) have long been grown for food,

fodder and soiling plants. The yellow lupine (*L. luteus*) of southern Europe, likewise an ancient fodder plant, is useful as an ornamental. Several American species are grown in gardens.

LUPUS (gen. *Lupi*), the wolf, a southern constellation between the Scorpion and Centaurus. It comprises a number of stars of the third and fourth magnitude, many of which are blue. *See* STAR: *map.*

LUPUS, a skin disease occurring in several forms. *Lupus vulgaris* is one form of tuberculosis of the skin, characterized by patches of papules which tend to form ulcers and scars. The disease may last for years or even a lifetime. Its treatment consists in building up the general condition of the patient, plenty of sunshine, and the judicious application of caustic, or even curettement or scarification of the lesions. The X-ray is valuable in some cases, but others are not benefited. (*See also* LIGHT, ARTIFICIAL, IN TREATMENT OF DISEASE.)

Lupus erythematosus somewhat resembles lupus vulgaris, but it tends to form scales rather than ulcers. It is doubtful whether or not the tubercle bacillus is a cause. There is no efficient treatment.

LURAY CAVERN, a vast cave in Page Co., Virginia, near the town of Luray, Va., on the Norfolk and Western railway about 90 mi. northwest of Richmond. The cavern was discovered Aug. 13, 1878. It underlies more than half a square mile in the foothills of the Blue Ridge Mountains and its galleries rising tier upon tier attain a height of almost 300 ft. The coloration of the stalactites and stalagmites in this cavern presents one of the most remarkable natural displays in the world; the unusual combination of yellow, red, or brown with white, pink, blue or amber representing two distinct periods of formation. Several stalactites and stalagmites exceed 50 ft. in length. There are no springs or streams but there are hundreds of small basins from 1 to 50 ft. in diameter and as much as 15 ft. deep which contain water of exquisite purity. A few bats, rats, mice, flies, spiders and small centipedes are the sole inhabitants of the cave. The temperature is uniformly 54° and the air is pure. In the portions of the cavern open to the public paths have been made and electric lights installed.

LURIA, ISAAC (1534-72), founder of the newer system of Jewish Cabala, usually called Lurian Cabala, was born at Jerusalem in 1534. After his father's early death, Luria studied Talmud in Cairo, Egypt; but its tremendous intricacies and perplexing dialectics caused him to seek consolation in mysticism and solitude. As the result of his 13 years of hermit life and brooding, and of his intense study of the Zohar, the text-book of Cabala, he became a confirmed and avowed visionary, and devoted the remainder of his life to Cabalistic pursuits and studies as based on the Zohar, which he regarded as an authentic work of the 1st century and therefore as divine, the product of a supreme wisdom. Toward the end of his brief life, in 1569, he settled at Safed, Palestine, the seat of the Cabalistic movement, where he soon became a prominent personage. He died here in 1572, and became glorified and almost deified in Cabalistic traditions.

See Graetz, *History of the Jews,* 1926.

LUSIAD, THE (*Os Lusiadas*), the national Portuguese epic, by LUIZ VAS DE CAMOËNS, published 1572, comprising ten cantos in *ottava rima.* An outstanding modern epic, this great poem celebrates the adventures of the navigator, Vasco da Gama. The narrative of Gama's famous voyage—round the Cape to Mozambique, to Melinda, Africa, thence to Calcutta, and the return to Lisbon—is told in excellent verse, and is frequently heightened with incidents of the divine interference of Bacchus and Venus. Two especially notable passages are those which deal with the romantic death of Ines de Castro and the appearance of Adamastor, Spirit of the Storm.

LUSITANIA, in ancient Hispania, a district which roughly corresponded in its extent to modern Portugal. It was named for its mythical founder, Lusus, the companion of Bacchus. Its inhabitants, the Lusitani, were subdued by the Romans about 140 B.C. The *Lusitania* was a transatlantic liner sunk by a German submarine off Kinsdale Head, Ireland, May 7, 1915. Of the 1, 198 persons drowned, 114 were American citizens.

LUTECIUM, a metallic chemical element belonging to the RARE EARTHS, exceedingly scarce in occurrence. Its chemical symbol is Lu, the atomic weight, 175.0. Its salts give colorless solutions. It was discovered by Urbain in 1906.

LUTHER, MARTIN (1483-1546), German religious reformer and translator of the Bible, was born at Eisleben, Prussian Saxony, Nov. 10, 1483. His early life seems to have been marked by ceaseless conflicts with a harsh and unsympathetic father. Luther's early education was received at Eisenach and Magdeburg, and in 1501, following his father's desires, he matriculated at the University of Erfurt, studying jurisprudence. But determining to become a monk, he joined the Augustinians at Erfurt, becoming a priest two years later. In 1508 he taught philosophy and dialectics at the University of Wittenberg, continuing his studies of theological subjects. It is generally believed that he visited Rome in 1510 or 1511, though this has been questioned by reputable authorities. In 1511 he became sub-prior of Wittenberg, and then for a number of years led a very active life as vicar-general in Saxony and Thuringia.

This period of Luther's life is marked by constant interior conflicts, and by the gradual abandonment of his priestly duties for the intensive study of theological matters. The Dominican, John Tetzel (1465-1519), having been appointed by the archbishop general-subcommissary, had begun to preach indulgences in what Luther considered a mercenary manner. As was then customary in such situation, Luther, on Oct. 31, 1517, nailed his 95 theses opposing these methods, to the church door of the University of Wittenberg. This place was considered the bulletin board of the university, and Luther's challenge was no more than an academic rejoinder to Tetzel's practice. Such an

act was quite usual at the time, and was not considered as an open declaration of war on the church. A copy was also sent to the archbishop, by whom the theses were immediately condemned as heretical. Luther was summoned to Rome by the pope, but pleaded that the trip could not be taken except at the risk of his life. He was therefore allowed to appear before the Diet of Augsburg, where he took a very decided and irreconcilable stand.

At the moment there was brewing in Germany open opposition to the authority of Rome, and to Luther's support came certain of the powerful nobles who recognized in him an eloquent and powerful advocate. Without his especially desiring it, he found himself the mouthpiece of a group of men who were without scruple. Undoubtedly misled by them, he wrote his famous *Address to the Christian Nobles of the German Nation.* In the same year, 1520, Leo X excommunicated him, but all attempts to publish the bull of excommunication in Germany aroused widespread resistance and disorder. And when Luther's writings were burned in Rome, he retaliated by burning the pope's bull in Wittenburg. A year later he was summoned to the Diet of Worms by the Emperor Charles V. On his way home he was waylaid by his friends in the forests of Thuringia and taken to the castle of Wartburg, where he lived as the Juncker George for ten months. With MELANCHTHON, he here began the translation of the Bible into German. The New Testament was published in 1522, the Old Testament not being issued until 1534.

Luther's translation is ranked very highly by scholars, it being thought better, in many ways, than the Vulgate or the St. James version. It had a profound effect upon the slowly crystallizing German language, giving it form and character.

At about this time Luther unfortunately antagonized ERASMUS, the leader of the Humanists (*see* HUMANISM), who had, at first, been a supporter of the Reformation, and who was one of the leading scholars of the time. Undoubtedly, Luther's writings and his public utterances did much to bring about the Peasants' War, in 1529, a terrible conflict between nobles and commoners which laid Germany under a terrific blight from which she did not recover for years.

In 1525 he married Katherine von Bora, a Bernardine nun, and in 1529 he composed the Augsburg Confession. This document has served ever since as the symbolic basis of Lutheranism. Toward the end of Luther's life, his writings became more and more polemic in character and increasingly bitter in tone, though he wrote many hymns including the famous *Ein Feste Burg ist Unser Gott,* the melody of which he composed as well. He died at Eisleben, Feb. 18, 1546.

BIBLIOGRAPHY.—T. Lindsay, *Martin Luther and the German Reformation;* A. C. McGiffert, *Martin Luther, the Man and His Work;* P. Smith, *Life and Letters of Martin Luther.*

LUTHERANS. The distinctive teachings of Lutherans grow out of the fact that the central doctrine in all Lutheran theology is the person of Christ. They hold that the believer is adjusted to the divine requirements solely by his personal trust in Christ. In their approach to the Bible, which they hold to be the Word of God, they are not, as a rule, literalists but admit the use of scientific methods and look only for the message of salvation and life through Christ. They hold to the real presence of Christ, the whole divine-human Christ, in the Lord's Supper and they reject transubstantiation and consubstantiation as well as symbolism. They maintain that the first and chief business of the Church is religious, not social, political, nor even moral. The distinctive beliefs of the Lutheran Churches are found chiefly in Luther's *Small Catechism,* 1529; the *Augsburg Confession,* 1530, and the *Formula of Concord,* 1577.

Lutherans do not regard any one form of church government as divinely prescribed. They allow circumstances to dictate the most expedient form of external organization. In America the organization has been, at least in theory, congregational. But the tendency is to enlarge the powers of synods and general bodies. In Denmark, Norway and Sweden the Lutherans are episcopally organized. In some parts of Germany they have bishops, in others superintendents. In Sweden and Finland they have archbishops. But everywhere the powers of these personal heads are very limited, and nowhere is episcopacy regarded as a necessary mark of the true Church.

In America. The Lutherans of the world constitute the largest Protestant group. In America they rank third among Protestant denominations. They were among the earliest European settlers on American shores, and the Lutheran Church was thoroughly rooted in the soil when the American Republic was born. The chief source of Lutheran population in the American colonies was immigration from Germany. The main current flowed into Pennsylvania, so that by the middle of the 18th century there were perhaps 60,000 Lutherans in that colony. The first organization was effected in Philadelphia by Henry Melchior Muhlenberg, who had been sent out from the University of Halle in response to appeals from America. His sons afterwards played a conspicuous part in the Revolutionary War and the founding of the Republic. In 1748 he organized the first synod, known to-day as the Ministerium of Pennsylvania. Other synods followed: in New York in 1786, in North Carolina in 1803, in Ohio in 1818, in Maryland and Virginia in 1820, and in Tennessee in 1820.

The effort to bring about cooperation among these synods led to the organization of the General Synod in 1820. The general body proceeded to organize its own educational institutions and carry on its own missionary operations independently of European Lutherans. Then came a period of great numerical increase and territorial expansion, due in part to fresh tides of immigration from Germany and the Scandinavian countries. Before the middle of the 19th century the General Synod extended far into the Middle West, where it came into touch with younger

and more conservative Lutheran bodies, formed out of more recent immigrants. Such were the Missouri Synod organized of German Lutherans in 1847 with headquarters at St. Louis, the Iowa Synod organized of Germans in 1854, and the Augustana Synod organized of Swedes and Norwegians in 1860.

Divisions in Church. In the atmosphere of strife that prevailed in all American life during the middle period of the 19th century the ranks of the General Synod suffered several breaches. The southern synods withdrew and in 1863 organized the United Synod in the South. The northern body was further split by doctrinal and personal differences, and in 1867 the General Council was organized. There was much rivalry and conflict between the two bodies in the north as they expanded westward to the Pacific. Meanwhile among the German and Scandinavian Lutherans in the Middle West and the Northwest theological controversy raged fiercely and there was many a division and subdivision in their ranks.

The 20th century has been a period of rapprochement among all the Lutherans in America, both along doctrinal lines and in practical work. This was due to a number of factors but chiefly to the advent of a new generation of leaders and the rise of a general spirit of cooperation to take the place of competition and strife. In 1917, the quadricentennial of the Lutheran Reformation, the several Norwegian bodies united to form the Norwegian Lutheran Church. The next year the General Synod, the General Council, and the United Synod in the South reunited to form the United Lutheran Church in America. That same year four German synods in the Middle West formed the Joint Synod of Wisconsin. In 1930 the Ohio, Iowa and Buffalo synods merged and formed the American Lutheran Church. Meanwhile all of these Lutheran bodies, except the Missouri Synod, were cooperating in the work of the National Lutheran Council, which had been set up in 1918 as a clearing-house for general Lutheran activities in America.

The number of communicant church members in all the Lutheran churches of America in 1931 was 2,806,797; the number of pastors, 11,826; the number of congregations, 16,730. Of these totals about one-third belonged to the United Lutheran Church in America and one-third to the Missouri Synod. The number of organizations among the Lutherans in America (17) is due chiefly to the variety of their national origins and the variety of circumstances under which they began their life in the western world. As the barriers of nationality and language decline the sense of solidarity is growing. There is much more prospect of organic consolidation of the Lutherans in America than of the union of any Lutheran body with any body of non-Lutherans. But Lutherans lay little stress upon external organization. They have little zeal for Church Union movements, because they hold that internal unity is far more important than external union. Any kind of organization, large or small, episcopal or congregational, is satisfactory, if only it be an effective means for the proclamation and application of Christian truth. But many Lutheran ministers and people and many administrative agencies cooperate across denominational boundaries and join in general Christian enterprises at home and abroad. At the close of the World War in 1918 the Lutherans in America through their National Lutheran Council took the initiative in organizing the Lutheran World Convention. It met in Eisenach, Germany, in 1923 and in Copenhagen in 1929.

Other Countries. Lutheranism is found in 22 countries. It is the established church in Denmark, Sweden and Norway, and the prevailing form of Protestantism in Germany. The Lutheran World Convention, with its headquarters in New York, unites in a common bond of fellowship and cooperation most of the 82,000,000 of Lutherans among the various nations, including the vigorous young churches founded by Lutheran missionaries in India, China, Japan and Africa. A. R. W.

BIBLIOGRAPHY.—*See* Wentz, *The Lutheran Church in American History;* Jorgensen, Fleisch and Wentz, *The Lutheran Churches of the World,* and the various issues of the *Lutheran World Almanac and Encyclopedia.*

LUTHER COLLEGE, an institution for men at Decorah, Ia., controlled by the Norwegian Lutheran Church of America. It was founded in 1861 at Halfway Creek, near La Cross, Wis., and was moved to Decorah in 1862. The endowment funds in 1931 were $680,282. Koren Library of 38,000 volumes, contains a special collection of Norwegian Americana. In 1930-31 there were 348 students and a faculty of 32, headed by Pres. Oscar L. Olsen.

LUTHER LEAGUE OF AMERICA, THE, a young people's society which grew out of the *Jung-Maenner-Verein* of St. Peter's Evangelical Lutheran Church of New York City in 1887, though it was not organized as a federation of all such young people's societies in the Luthern Church until 1895. Its motto is *Of the Church, By the Church, For the Church,* and its purpose is to foster a spirit of loyalty to the Lutheran Church among youthful adherents and to train them for its service. Its membership is now in excess of 100,000, which is not only located in the United States but also in other lands, where it does active missionary work.

LUTON, a municipal borough of Bedfordshire, England, situated in the valley of the Lea on the south flank of the Chiltern hills, 30 mi. northwest of London. It has been the headquarters of straw-goods manufacture in England since a colony of straw-plaiters followed James I from Scotland and settled in the town. Large quantities of hats and other articles of straw are exported, and with its rapidly increasing industrial importance, Luton is acquiring other interests, among them, foundries, chemical and dye works, motor, vacuum-cleaner and other manufactures. Pop. 1921, 60,266; 1931, 68,526.

LÜTZEN, BATTLE OF, a celebrated encounter of the THIRTY YEARS WAR between the Protestant forces under Gustavus Adolphus, joined by the army

of Bernard, Duke of Saxe-Weimar, and the Imperialist Catholic troops commanded by Wallenstein. The forces met on Nov. 16, 1632, near the town of Lützen in Prussian Saxony. Gustavus formed a battlefront of two lines, supported by a reserve, with cavalry wings on both flanks, the line extending southeast of the Leipzig road. The Imperial front, also in two lines, was deployed on the other side of the road, Wallenstein's left inclining toward the Swedish right. Gustavus was killed in a cavalry charge, and Pappenheim, one of the Imperial field-marshals, also lost his life. Casualties were about 10,000 on each side. Lützen was a Swedish victory; but the loss of Gustavus was a serious blow to the allies.

LUVIAN, an extinct language akin to KANISIAN, of which some brief fragments have survived in CUNEIFORM texts discovered at Boghaz-köi in Asia Minor. The area in which it was spoken is thus far quite uncertain.

LUXEMBOURG, a small European principality interposed between France, Germany and Belgium. Its ruler in 1932 was the Grand Duchess Charlotte, who succeeded to the throne in 1919. The principality has an area of 999 sq. mi. and in 1930 had a population of 300,748. Luxembourg, the capital, had a population of 52,126 in 1930, and Esch am Alz, noted for its mines, 27,143 inhabitants in 1927. Other important cities are: Differdange, with a population of 16,242; Dudelange, 12,968; Rumelange, 5,275; and Diekitch, 3,958. Luxembourg is a Catholic country. Education is compulsory to all between the ages of 6 and 13. There are 25 higher elementary schools, three classical and two commerce and industrial colleges, two girls' colleges, four technical schools, two teachers' training colleges, a mining school, a college of agriculture and an academy of music.

Agriculture engages 32% of the population. The chief crops are oats and potatoes, the chief industries, mining and metallurgy. The most important mineral products are iron ore, cast iron and steel. In 1927 there were 1,297 mi. of state roads and in 1929, 342 mi. of railroads.

The constitution of 1868 was amended in 1919 so that the sovereign power is vested in the nation. Secret treaties were abolished and the House of Deputies is elected by universal suffrage on the basis of proportional representation. The Chamber of Deputies consists of 52 members elected for a period of six years. Half of these are elected every three years. The Council of State consists of 15 members appointed by the sovereign for life. The estimated revenue for 1931 was 483,208,583 francs; the estimated expenditures, 445,588,010 francs. The franc is the monetary unit of Luxembourg.

History. For the early history of Luxembourg *see* NETHERLANDS and BELGIUM. The original duchy of Luxembourg was considerably larger than the present duchy. In the creation of the Kingdom of the Netherlands, uniting the modern Belgium and Holland after the downfall of Napoleon, the eastern portion, the modern grand-duchy, was included in the German Confederation, although, like the western portion, it was under the sovereignty of the King of the Netherlands. By the terms of the treaties establishing the separation of Belgium and Holland the western portion was ceded to Belgium. Belgium claimed the eastern portion also; but the powers refused to grant her claim. This section remained within the German Confederation and in 1842 joined the German customs union. On the dissolution of the Confederation in 1866 it was agreed by the Treaty of London in 1867 that Luxembourg should not join the North German Confederation but should remain a neutral state. In Aug. 1914 Luxembourg was occupied by German troops to secure the use of her strategic railways. On the withdrawal of the German troops in 1918 Luxembourg's independence was reestablished and the customs union with Germany severed. In 1920 a railway, customs and consular union was effected with Belgium.

LUXEMBOURG, capital of the grand duchy of LUXEMBOURG, situated on the Alzette River about 100 mi. from Brussels. The city is spread out on cliffs above the banks of the river and lies partly in a narrow valley. It was once strongly fortified, but according to the provisions of the Treaty of London of 1867 the fortifications were razed. There are many notable buildings. The town hall houses a collection of valuable paintings. The grand ducal palace, the church of Notre Dame, built in 1613, and the library are all noteworthy. The public squares and gardens of Luxembourg are embellished by numerous sculptures and are noted for their beauty. Among the industries, distilling, brewing, tanning, dyeing and the manufacturing of textiles are the most important. An annual fair takes place on Aug. 24 and attracts many visitors from other countries. This fair has been a regular feature of the city's life since 1340. Pop. 1930, 52,126.

LUXEMBOURG MUSEUM, an important museum of contemporary art in the Rue de Vaugirard, Paris, France. Begun originally as an extension of the art gallery of the LUXEMBOURG PALACE, it became a museum of contemporary art under Louis XVIII in 1818. It contains 11 galleries of paintings, a *Salle des Statues* and collections of gems and medals. An artist's work usually remains at the Luxembourg until 10 years after his death, when it may be transferred either to the LOUVRE or to a provincial museum.

LUXEMBOURG PALACE, a former royal residence on the Left Bank, Paris, France. It was designed and built by Solomon de Brosse for Marie de' Medici in 1616-20, and was so named because it occupied the site of the Duke of Piney-Luxembourg's mansion. The central H shaped portion faces a large court of honor. The palace was richly decorated by RUBENS, Philippe de Champaigne and others, but most of its art treasures have been transferred to the LOUVRE. A prison during the revolution and subsequently occupied by various legislative bodies, it has been the seat of the French Senate since 1879. The Luxembourg Gardens originally laid out by de Brosse

contain trees, flower beds, walks and numerous statues and fountains.

LUXURY TAXES, taxes imposed on certain articles legally designated as luxuries. The purpose of such taxation is to impose heavier burdens on those more able to pay, and its use implies a belief that the expenditure for articles in the luxury class will be made solely or chiefly by those with larger incomes and greater buying power.

During the World War the Federal tax system was extended to a group of articles of supposedly luxurious consumption. Cosmetics and toilet goods were taxed by affixing to each package tax stamps of specific amounts, the tax varying, though not exactly, with the price. Other articles, such as silk stockings and theater tickets, were taxed if sold for more than stated minimum prices. The European sales taxes have undertaken in some instances special taxation of designated luxury commodities.

The principal obstacle to a logical application of such a tax in a community in which consumption standards are not established by class or caste lines is the definition of luxury consumption. The same article may be considered a luxury by one person and a necessity by another. The fact that articles in the official luxury group are bought does not uniformly indicate large buying power or high taxable capacity. It may merely reflect the standards of consumers' wants and tastes. The shop girl may want silk stockings more than anything else. If she gratifies this desire by making the necessary sacrifices at other points in her budget, who shall say that here is an instance of luxurious expenditure? Under the conditions prevailing in a society free of class or caste distinctions, the incidence of a so-called tax on luxury articles may be very different from that which the term implies. H. L. L.

LUYTENS, SIR EDWIN L. (1869-), English architect, was born in London, Mar. 29, 1869. He was a member of the committee to advise the government of India as to the site of Delhi, and was architect for Government House, Delphi. His works include Whitehall Cenotaph, in London; British School of Art; British Art Exhibition, Rome; and head offices of the Anglo-Persian Oil Company, Ltd. Luytens was one of the principal architects for the Imperial War Graves Commission. He was knighted in 1918.

LUZERNE, a borough of Luzerne Co., in northeastern Pennsylvania, situated on the Susquehanna River adjoining Kingston on the north. It is served by two railroads. Anthracite coal mining is the principal industry; there are also flour, silk and feed mills. Luzerne is the business center for the adjoining towns. Pop. 1920, 5,998; 1930, 6,950.

LUZZATTI, LUIGI (1841-1927), Italian economist and statesman, was born at Venice, Mar. 11, 1841. He was successively professor of political economy at Padua, Perugia and Rome. Luzzatti introduced Italy into the economic principles of SCHULTZE-DELITZSCH and advocated the establishment of commercial schools, people's banks and loan associations. He opened the first cooperative store in Italy and assisted in introducing the protective tariff. In 1909 he became prime minister with the title for life of Minister of State. He died Mar. 29, 1927.

LUZZATTO, MOSES HAYIM (1707-46), Italian cabbalist, dramatist and lyrical poet, was born in the Jewish ghetto of Padua, Italy, in 1707, and given an education both religious and secular. An ardent student of ancient Hebrew literature, he was likewise imbued with the spirit of Italian culture. At the age of 16, he started to write a Hebrew rhetoric, *Leshon Limmudim,* and a biblical drama of powerful style, *Maase Shimshon,* then another drama, *Migdal oz.* Fascinated by the study of the cabbala, the youthful genius organized a cabbalistic circle of students, admirers of his. Jekuthiel Gordon, a member of that circle, in a letter to a friend, observed that in Luzzatto they discovered a holy man, with whom angels are in daily communion. This letter fell into the hands of Rabbi Moses Haggiz, who previously taught the followers of the pseudo-Messiah *Sabbatai Zevi;* and persecution of Luzzatto by the rabbis began at once. His books were excommunicated; his publishing of treatises in cabbala, forbidden. Finally Luzzatto emigrated to Amsterdam, Holland, where he spent some years peacefully in writing his two masterpieces: in ethics, *Messilat Yesharim,* and in drama, *Layesharim Tehillah.* But his restless spirit made him go to the Holy Land, where he and his family succumbed to the plague in 1746. S. G.

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LUZZATTO, SAMUEL DAVID (1800-65), Jewish scholar and writer, was born in Aug. 1800, at Trieste, then Austria. He was educated at the Jewish Free School of his native city. He specialized in the study of Semitic languages and literature. When the Collegio Rabbinico was established at Padua in 1829 Luzzatto became the most distinguished member of its faculty. His literary labors were concerned with a variety of subjects, more especially with the study of the Hebrew and Aramaic languages, the Bible, homiletics, Jewish history, philosophy and poetry. Himself the author of two volumes of Hebrew verse, he also edited and published the poetic writings of many of the outstanding medieval Hebrew poets. He died in Padua on Sept. 30, 1865.

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LVOV, PRINCE GEORGE EUGENIEVICH (1861-1925), Russian statesman, member of an old Russian family tracing its descent from Rjuricks, was born Oct. 21, 1861. He was a disciple of Tolstoy and entirely devoted to the Zemstov or local government. In the World War Lvov was president of the All-Russian Union of Zemstovs, and active in the commissariat division of the armies and upon the abduction of the Tsar in March 1917 he was placed

at the head of the first provisional government. In July he resigned and fled in 1918 to conduct the relief organization for the Emigrés. He died in Paris Mar. 6, 1925.

LWOW. *See* LEMBERG.

LYAUTEY, LOUIS HUBERT GONZALVE (1854-), French general and colonial administrator, was born at Nancy, Nov. 17, 1854. He received his military training at St. Cyr, and in 1894 joined the forces of General Gallieni in Indo-China. In Madagascar he successfully applied new methods of colonial administration and was sent to Morocco in 1912 as resident minister. During the World War, for an interim of three months in 1917, he was minister of war. During 1920-25 he restored order in Morocco, forced the capitulation of Abd-el-Krim, and inaugurated measures for the economic development of the country. In recognition of his services, he was made a marshal of France in 1921. He was recalled from Africa in 1925.

LYCAEUS or **LYCEUS, MOUNT,** the highest mountain of Arcadia, in Greece, rising to a height of 4,659 ft. It is northwest of Megalopolis. On the summit of Mt. Lycaeus was a temple dedicated to Zeus, and also one to Pan, and hence both gods sometimes went by the name of the mountain. The famous Lycaean games, known as the Lycea, were celebrated here every nine years. Mt. Lyceus was also the seat of the activities of Lycaon, the mythological character who was turned into a wolf.

LYCANTHROPY, the reputed power of turning men into wolves.

LYCÉE, a secondary school in France supported and controlled by the state. Early lycées for boys were classical institutions, emphasis being laid on Latin and Greek. Since the beginning of the 20th century there has been a gradual breaking away from classical traditions, modern languages and sciences being given equal recognition. Girls' lycées from the first stressed French and literature rather than classical languages. Lycées confer a degree similar to the bachelor's degree. The collèges, also secondary schools, are supported by the state and municipality.

LYCHNIS, a genus of annual and perennial herbs of the pink family many of which are grown as garden ornamentals. There are nearly 40 species native to the north temperate and arctic zones; about 15 species occur in North America. They are usually erect plants with entire leaves and showy red, pink or white flowers borne mostly in terminal clusters. Among the most popular in cultivation are the mullein pink or DUSTY MILLER (*L. Coronaria*), the flower of Jove (*L. Flos-Jovis*), the rose of heaven (*L. Cœlirosa*), the RAGGED ROBIN (*L. Flos-cuculi*) and the MALTESE CROSS (*L. chalcedonica*).

LYCIAN, an extinct language spoken in the ancient area of Lycia in Asia Minor and known from some 150 inscriptions, mostly sepulchral, of about the 5th or 4th century B.C. The texts are often accompanied by Greek paraphrases, and the only inscription of any length is the Stele of Xanthos. Many of the inflectional endings resemble those of INDO-EUROPEAN, but the linguistic affinities of Lycian are still uncertain.

BIBLIOGRAPHY.—E. Kalinka, *Tituli Lyciae lingua Lycia conscripti,* 1901; T. Kluge, *Die lykischen Inschriften,* 1910.

LYCOPHRON (fl. 260 B.C.), Greek poet and grammarian, was born at Chalcis, in Euboea, in the 3rd century B.C. He settled in Alexandria and was put in charge of arranging the library by Ptolemy Philadelphus. While carrying out this commission, he wrote a lengthy treatise on Greek comedy with accounts of the poets. Lycophron also wrote a number of tragedies. His poem, *Cassandra* or *Alexandra,* is the only one of the author's writings which has come down to us.

LYCOPODIUM, a numerous genus of flowerless plants allied to the ferns and horsetails. There are about 100 species, commonly called club mosses, native to tropical and temperate regions, chiefly in mountainous districts; 17 are found in North America. They are low perennial herbs with erect, trailing or creeping stems bearing narrow needle-like or scale-like evergreen leaves, arranged in several ranks, and very numerous spores in spore-cases (sporangia) in the leaf axils or in scaly terminal spikes. Several species as *L. obscurum, L. clavatum* and *L. complanatum,* popularly called ground pine, are used for holiday decorations. The spores of *L. clavatum* furnish the lycopodium powder or vegetable sulphur used in pharmacy and in making fireworks. The ancestral forms of *Lycopodium* were of great size and importance in Palaeozoic times when they formed one of the dominant classes in the forests of the Carboniferous or Coal period.

LYCURGUS (c. 396-c. 325 B.C.), Greek orator, was born near Athens, about 396 B.C. He is said to have been the pupil of Plato and Isocrates. In the struggle with Philip of Macedon, Lycurgus led the national party, devoting himself to the management of Athenian finances. He was greatly esteemed for his integrity. When Alexander the Great ordered Lycurgus delivered up to him, the citizens refused to obey. Beautifying Athens, he had statues erected to the three great tragic writers, and preserved their works in the archives. His orations show great nobility of spirit, but in style are lacking in finesse.

LYDEKKER, RICHARD (1849-1915), English zoölogist and palaeontologist, was born at London, July 25, 1849. Educated at Trinity College, Cambridge, he joined the Geological Survey of India in 1874, resigning this position to devote himself to private study in 1882. His writings include *An Introduction to the Study of Mammals, Living and Extinct,* jointly with W. H. Fowler in 1891; the *Royal Natural History,* with P. L. Sclater from 1893 to 1897; *Geographical History of Mammals,* 1896; *Some Animals of India,* 1907; *The Ox and its Kindred,* 1912; *The Sheep and its Cousins,* 1912; and a catalogue of the ungulate mammals in the British Museum. Lydekker died at Harpenden, April 16, 1915.

LYDGATE, JOHN (1370-1451), English poet, was born at Lydgate, near Newmarket, about 1370.

He is said to have studied at Oxford and Cambridge, and was ordained priest in 1397. From 1423-34 he was prior at Hatfield, Broadoak. Retiring to enter the Benedictine order, he established a school of rhetoric and philosophy at the monastery of Bury St. Edmunds. Chaucer was his friend and "master." Lydgate was the most voluminous writer of verse in England during the period from Chaucer to Spenser, but most of his writings are prolix rather than finished. That he was capable of artistry, however, is shown by such pieces as *The Complaint of the Black Knight* and *The Temple of Glass.* Among his writings are *The Troy Book* and *The Falls of Princes.* The last is valuable as a contemporary record. Lydgate died about the middle of the 15th century.

LYDIA, an ancient country of central Asia Minor, the capital of which was Sardis. The earliest dynasty was that of conquerors from Phrygia; but a native of Lydia, Gyges, usurped the throne in the 7th century B.C. and first attempted to conquer the Greek cities of the Ionian coast, a design not carried through until the reign of Croesus, 560-546 B.C. The captured cities brought Lydia almost as near to Europe as to Asia; Croesus respected Greek religion and culture, and the Greeks regarded the Lydians as almost civilized. But Lydia, as events proved, was the instrument for bringing the Ionian Greeks under Persian rule, for when CYRUS THE GREAT of Persia captured Sardis in 546 B.C., the result was not only the extinction of Lydia as an independent kingdom, but the eventual revolt of the Greeks against Persia, culminating in the Persian invasion of Europe. Lydia became a Persian satrapy, or province.

The greatest contribution of Lydia to civilization was the invention of coinage. Gold and silver had previously been used for exchange; but Lydia in the 7th century took the additional step of standardizing the pieces of metal and stamping them as of a certain purity and weight. The new invention spread rapidly throughout the ancient world, owing to the close relationship between Greece and Lydia, and accelerated the development of trade.

LYDIAN, an extinct language spoken in the ancient region of Lydia in Asia Minor, known only from a few glosses and from 34 inscriptions of the 5th or 4th century B.C. written in the Greek alphabet, one of the texts being accompanied by an ARAMAIC version. Its linguistic affinities are doubtful, but it was almost certainly not INDO-EUROPEAN, and may have been akin to ETRUSCAN.

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LYE, a strong caustic alkaline solution, obtained by leaching wood ashes. Crude lye is used in the manufacture of certain coarse soaps. The word is also used of an aqueous solution of any caustic or carbonated alkali, as potash, which is a product of concentrated leached lye. *See also* ALKALIS; CAUSTICS.

LYELL, SIR CHARLES (1797-1875), British geologist, born at Kinnordy, Forfarshire, Scotland. In his youth he was interested in natural history and was a student of geology at Exeter College, Oxford. Later he entered law, but in 1827 he definitely devoted himself to geology, publishing the first volume of his *Principles of Geology* in 1830 and becoming professor of geology at London in 1831. Later he studied the fossils of the Italian Tertiary and suggested the modern divisions of that period. His *Elements of Geology,* published in 1838, became at once, and long remained, the outstanding authority on stratigraphical geology and palaeonatology. In 1863 he defended the early origin of man, at least postpliocene. In 1848 he was made a knight and 16 years later became a baronet. He died at London, Feb. 22, 1875.

LYGINODENDRON, a generic name instituted by Gourlie for certain fossil stems found in the Coal Measures which were later identified with the first recognized seed fern. By some authorities the name *Lyginodendron* is retained for the plant, better called *Lyginopteris,* under which name it is described in this work.

The fossil seed of this plant, the first known as borne directly upon a fern-like foliage-leaf, had its own generic name (*Lagenostoma*). The monostelic stems (*Lyginodendron*) had elements suggesting both ferns and cycads. Only in the early 20th century were these, and roots, petioles, leaflets, pollen-bearing organs, and seeds found within the coal-balls, gradually brought together to complete the reconstruction of the Paleozoic seed fern.

LYGINOPTERIS, the earliest recognized and best known of extinct seed ferns, found fossil in the Coal Measures. In habit this plant, by some authorities called LYGINODENDRON, was like a small, slender tree-fern. The stalk was propped below by adventitious roots and bore a large, graceful crown of finely divided fronds suggesting those of living aspleniums. Stem and fronds were studded with peculiar little stalked glands, known in no other Paleozoic plant. The recognition of precisely such glands upon certain nutlike fossils the size of filberts, led to the important discovery that this supposed fern bore seeds, probably upon a naked portion of the frond. Later, pollen-bearing organs, little oval fertile leaflets fringed with hanging sporangia, were discovered.

LYLY, JOHN (1554-1606), English writer and dramatist, was born in the Weald of Kent about 1554. He was educated at Oxford and Cambridge universities and afterward went to London where he strove without success to win a place at court, but secured the patronage of Lord Burghley and turned his attention to literary work. His famous novel, *Euphues, or the Anatomy of Wit,* appeared in 1579 and its second part, *Euphues and his England,* came out the next year and brought him immediate renown. This story of a fashionable Athenian youth furnished the model for a new vogue in writing that had a large following and added the new word, EUPHUISM, to the English language. It was an ornate, affected style, elaborated with epigrams, similes, antitheses and alliteration. Lyly also wrote eight comedies to be per-

formed at court by the children's companies of the Chapel Royal, among them being *Alexander and Campaspe, Sappho and Phao* and *Endymion*. Most of these are in prose and are thought to have had important influence in turning dramatists to the use of prose instead of verse. Many charming lyrics are scattered through them, setting a style that was followed by Shakespeare and others. Lyly was four times elected to Parliament, 1589-1601. He died in London, Nov. 30, 1606. *See also* ENGLISH LITERATURE.

BIBLIOGRAPHY.—J. D. Wilson, *John Lyly*, 1905.

LYMPH, the tissue-fluid of the body. The heart is constantly forcing blood against the capillary walls (*see* CAPILLARIES), and the filtrable components pass into the tissues to a certain extent. Utilizable constituents are taken from this fluid plasma by the cells. The unutilized portion, chiefly water, drains into small drainage ducts, the lymphatics. This fluid constitutes the lymph. The lymph ultimately passes back into the blood stream through two connections of the LYMPHATIC SYSTEM with the venous system.

LYMPHADENITIS. *See* LYMPHATIC SYSTEM, DISEASES OF.

LYMPHANGITIS, EPIDEMIC, a contagious disease of the horse caused by a specific organism, the *Cryptococcus farciminosus*. The lymphatic vessels immediately beneath the skin are affected and become swollen and suppurate. The infection may appear on the head and neck, or on the limbs or body and the symptoms resemble those of farcy. The disease may be diagnosed by testing the horse with mallein. There is no recognized treatment and the animal should be destroyed. *See also* FARCY.

LYMPHATIC SYSTEM, a complex branching arrangement of minute tubes conducting the LYMPH away from the tissues of the body to empty it into the veins after filtering it through lymph nodes distributed at various definite sites along the course of these vessels.

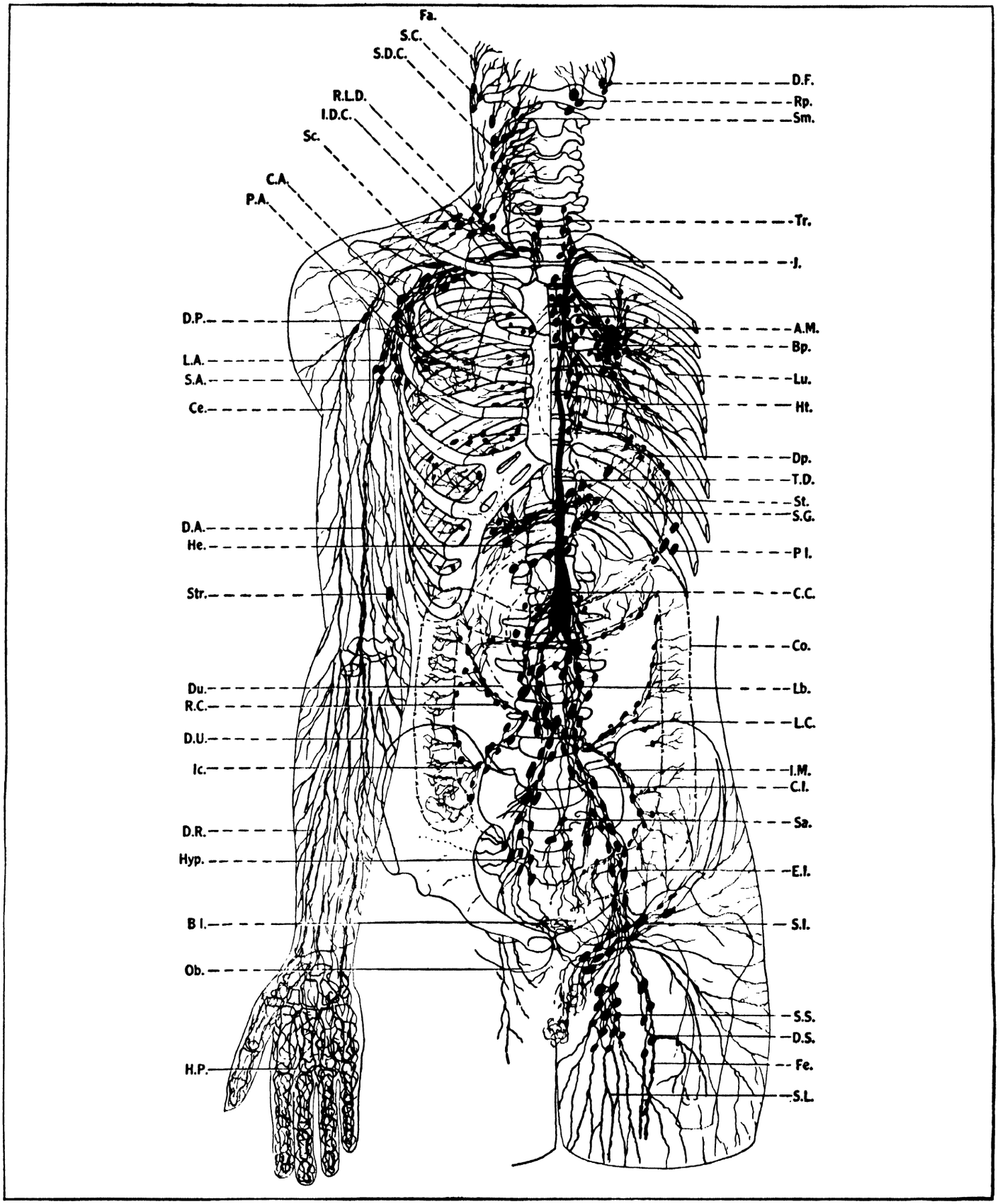
The lymph vessels or lymphatics somewhat resemble blood vessels in general structure (*see* ARTERY), but all coats, especially the muscular coat, are much reduced. The nodes are small bean-shaped bodies composed chiefly of lymphocytes (*see* BLOOD), held together by a pervading network of reticular tissue (*see* CONNECTIVE TISSUE) in which channels, called sinusoids, are left for the passage of the lymph. The lymph nodes serve passively and actively as filters for bacteria and other foreign matter that may enter the stream. In this way they prevent infection from spreading beyond their domain. However, by reason of the virulence of the infecting organism, they often become infected themselves, constituting a *lymphadenitis*. Red streaks radiating from an infected area indicate that the lymph vessels are inflamed from the infecting agent. This condition is termed *lymphangitis*. It is in such cases that the lymph nodes are most useful. Another indication of the filtering function of lymph nodes is given in the transformation into black, gritty nodules of those draining the lungs of city dwellers or coal miners.

The description of the anatomy of the lymphatic system reduces itself to that of the courses and directions of the vessels of the various regions, together with the situations and drainage areas of the various nodes. The channels are by no means as definite as those of the blood vascular system, the vessels being generally much more minute, and intercommunicating more freely. The deep vessels, especially of the muscular parts of the body, follow in general the direction of the blood vessels. Accordingly, the figures included with the articles ARTERIAL SYSTEM and VEIN might profitably be consulted for the course of these vessels. The superficial vessels, minute and closely arranged, have no particular relation to blood vessels. They are figured in the accompanying illustration, together with the various groups of lymph nodes, and the lymphatic system of the viscera.

The lymphatic vessels of the scalp drain into the occipital, posterior auricular and anterior auricular lymph nodes situated superficially at the base of the skull; those of the face into the parotid, facial, deep facial, lingual, and retropharyngeal groups. After passing through these nodes, the lymph enters the superficial or deep cervical nodes of the neck, where the lymph from the neck joins the stream. The lymph of the superior extremity and of the chest wall passes to the axillary glands, which are divided into five groups. The superficial vessels of the lower extremity drain into the inguinal group of glands; the deep vessels of this region pass to the iliac group situated on the inner wall of the pelvis along the great vessels lying there. Lymph vessels of the stomach connect with the superior and inferior gastric glands, situated respectively above and below that organ.

The lymphatics of the intestine are very numerous. Through these passages flows the digested fat absorbed by the lining of the intestine. After a meal these lymphatics are milky white in color, due to the contained fat. The channels drain into more than a hundred nodes in the MESENTERY, and pass into the thoracic duct. The latter structure is a thin tube about one quarter of an inch wide, but with an enlarged lower end, the cisterna chyli. It runs immediately in front of the thoracic vertebrae and empties into the point of junction of the subclavian and internal jugular veins on the left side. Here are added the trunk lymphatics of the left upper extremity and left side of the head and neck. Thus all the lymph of the body is emptied into the venous system at this point, excepting that of the right upper extremity, and right side of the thorax, head, and neck, which empty at a corresponding junction on the right side. W. J. S. K.

LYMPHATIC SYSTEM, DISEASES OF. Lymphoid tissue is scattered all over the body, but is mostly concentrated in the lymph nodes, spleen, thymus, and in the lymphoid follicles of the gastrointestinal tract. The lymph nodes act as filters for various foreign substances such as bacteria, finely divided particles, tumor cells, and cellular débris. They also are concerned with the production of



SUPERFICIAL AND DEEP LYMPH VESSELS AND NODES OF THE HUMAN BODY

A.M., *anterior mediastinal*; Bl., *plexus on bladder*; Bp., *bronchopulmonary*; C.A., *central axillary nodes*; C.C., *cisterna chyli*; Ce., *vessel accompanying cephalic vein*; C.I., *common iliac*; Co., *outline of colon*; D.A., *deep axillary*; D.F., *deep facial*; D.P., *deltoidopectoral*; D.R., *deep radial*; D.S., *deep subinguinal*; Du., *outline of duodenum*; D.U., *deep ulnar*; E.I., *external iliac*; Fa., *facial*; Fe., *vessels accompanying femoral artery*; He., *hepatic (liver)*; Ht., *vessels draining heart*; Hyp., *hypogastric*; Ic., *ileocolic*; I.D.C., *inferior deep cervical*; I.M., *inferior mesenteric*; J., *junction of thoracic duct with innominate vein*; L.A., *lateral axillary*; Lu., *lymph vessels of lung*; Lb., *lumbar*; Ob., *obturator*; P.A., *pectoral axillary*; P.H., *plexus on hand*; Pl., *pancreaticolienal*; R.C., *right colic*; R.L.D., *right lymphatic duct*; R.P., *retropharyngeal*; S.A., *subscapular axillary*; Sa., *sacral*; Sc., *subclavian*; S.C., *superficial cervical*; S.D.C., *superior deep cervical*; S.G., *superior gastric*; S.I., *superficial inguinal*; S.L., *superficial vessels of thigh*; Sm., *submaxillary*; S.S., *superficial subinguinal*; Str., *supratrochlear*; St., *outline of stomach*; T.D., *thoracic duct*; Tr., *tracheal* (*The mesenteric lymph nodes, about a hundred in number, and draining the small intestine, are omitted in this figure*).

lymphocytes, which may enter the blood stream or take part in reactions in the tissues.

Diseases of lymph nodes may be classified as follows: (1) simple hyperplasia; (2) infection; (3) lymphoblastoma; (4) other neoplasms; (5) regressive changes.

(1) **Simple Hyperplasia** is the enlargement encountered in the acute infectious diseases, in prolonged malnutrition and in certain chronic diseases, as infectious arthritis.

(2) **Infection.** (*a*) *Acute Lymphadenitis.* This may occur in any of the lymph nodes as the result of spreading by way of the blood or lymph channels of infection from another, usually a neighboring, part of the body. The nodes are enlarged and tender, the capsule is tense, and the blood vessels injected. The process may regress at this stage with complete repair, or chronic inflammation, pus formation, or necrosis may ensue. Small abscesses may localize and heal, the pus undergoes degeneration, is absorbed and scar tissue deposited; or the pus thickens and becomes infiltrated with lime salts.

(*b*) *Simple Chronic Lymphadenitis.* This form is due to repeated or long-continued irritation of the tissues. The irritants may be organic, such as bacteria and chemical substances, or mechanical, as dust particles. The result is chronic hyperplasia in which all the cells of the nodes are increased, but the architecture remains essentially intact. In other instances, fibrous induration and inflammatory connective tissue production occur in the capsule and in the trabeculae while the cellular elements undergo atrophy.

(*c*) *Infectious Mononucleosis* (Acute Benign Lymphoblastosis; Acute Lymphadenosis). Turck (1907) was the first to describe the disease, the principal features of which are an acute throat infection, occurring sporadically in young adults, accompanied by lymph node and splenic enlargement. The blood shows a relative and absolute lymphocytosis composed largely of pathological lymphocytes. The course is benign, with recovery.

(*d*) *Glandular Fever.* This disease was first described by Filatow (1885) who characterized glandular fever as an epidemic disease of young children accompanied by fever, lymphocytosis, enlargement of the lymph nodes, liver and spleen, with a benign course. There is a striking similarity betwen glandular fever and infectious mononucleosis, the main difference being that the former occurs usually in young children, in epidemic form without pronounced throat lesions or systemic reactions, whereas the latter occurs usually in young adults sporadically and is associated with moderate or severe throat lesions and with a well-marked systemic reaction.

The almost invariable favorable outcome of this disease is to be emphasized. It is often difficult, early in the disease, to differentiate infectious mononucleosis from acute lymphatic leukemia, an invariably fatal disease.

(*e*) *Tuberculosis of Lymph Nodes.* Tubercle bacilli enter by way of the blood or lymphatic channels. In the productive stage tubercles are accompanied by a soft inflammatory swelling and reddening of the entire node. Usually the infection in the lymph node is secondary, the primary focus being found in a neighboring organ. The infection may be accompanied by caseation which may spread and perforate into other organs or through the skin, or the caseous material may calcify, forming a permanently encapsulated hard mass. The perforation heals slowly and an open ulcer may remain unhealed for many weeks. (*See also* LIGHT, ARTIFICIAL, IN TREATMENT OF DISEASES.)

(*f*) *Syphilis of Lymph Nodes.* In the early secondary stage of syphilis the lymph nodes may become generally hyperplastic. Microscopically they are often difficult to differentiate from tuberculous nodes. Spirochetes may be demonstrated. The nodes have little tendency to soften, so that they rarely rupture, thus differing from tuberculous lymph nodes.

(3) **Lymphoblastoma** (Malignant Lymphoma; Lymphadenoma; Lymphogranulomatosis). This affection is characterized by insidious, painless, progressive enlargement usually of several groups of lymph nodes, often accompanied by fever and a severe anemia. The architecture of the lymph nodes is destroyed. Frequently the spleen and sometimes the liver are involved. It is often possible to subdivide the lymphoblastomata into the following diseases:

(*a*) *Hodgkin's Disease.* This was first comprehensively described by Hodgkin in 1832. It is about twice as common in men as in women. Young adults are especially susceptible. The etiology is unknown. There is a frequent occurrence of undoubted tuberculosis with Hodgkin's disease, and the old theory of its tuberculous origin has recently been revived. The histological changes which differentiate it from the other forms of lymphoblastoma are: the presence of fibrous tissue formation, of peculiar giant cells, and frequently of large numbers of eosinophils in the cut sections. The disease is said to be fatal in every instance, patients rarely living more than from three to five years.

(*b*) *Lymphosarcoma.* This may occur as a generalized enlargement of lymphatic structures with infiltrating tumors in various organs or as localized growths of single groups of lymph nodes. The tumor frequently invades the wall of the alimentary canal and serous surfaces of the pleura or peritoneum. Not infrequently, the tonsils are affected. It is characterized by its peculiar regional way of spreading, by its invasive or infiltrating lymphoid growth and by its rapidly progressive course.

(*c*) *Lymphatic Leukemia.* The glandular enlargement may be well-marked, but is uniform, occurring in practically all the lymph nodes of the body, a condition not usual in Hodgkin's disease. The blood shows the presence of an excessive relative and absolute number of lymphocytes some of which are definitely immature. This latter finding leads to the correct diagnosis. Acute lymphatic leukemia rapidly progresses to the death of the patient usually within a period of weeks, whereas with the chronic form patients may live for several years.

(*d*) *Aleukemic Lymphatic Leukemia.* The clinical picture is often indistinguishable from lymphatic leukemia, the only difference being that there is not a leukemic blood-picture. There may be a relative increase in lymphocytes or of immature lymphoid cells in the blood.

(4) **Other Neoplasms.** (*a*) *Primary sarcomas* of lymph nodes are rare and must be sharply separated from lymphosarcomas. The former metastasize by the blood route without involvement of adjacent lymph nodes. The forms taken are fibrosarcoma, spindle cell sarcoma, large and polymorphocellular sarcoma, melanosarcoma, angiosarcoma, and small round cell sarcoma.

(*b*) *Endotheliomas* also occur in lymph nodes and may be single or multiple. These tumors arise from the endothelium of the lymph channels. Endotheliomas of serous membranes and of other localities may metastasize to lymph nodes.

(*c*) *Carcinoma* occurs in lymph nodes only as a secondary growth. In contradistinction to sarcoma, carcinoma preferably infiltrates the nearest regional lymph nodes. The parenchyma of the lymph node is destroyed, the capsule is perforated and growth proceeds into the vicinity. Such lymph node metastases are usually irregular and stony hard.

(5) **Regressive Changes in Lymph Nodes.** As the result of old age, local infection or generalized diseases, lymph nodes may be the seat of hyalin, fatty or amyloid degeneration or they may become calcified or undergo atrophy. C. E. Fo.

LYMPHOBLASTOMA. *See* LYMPHATIC SYSTEM, DISEASES OF.

LYMPHOSARCOMA. *See* LYMPHATIC SYSTEM, DISEASES OF.

LYNBROOK, a village and residential suburb of New York City, N.Y., in Nassau Co., on the southwestern end of Long Island, 20 mi. from Brooklyn. The Long Island Railroad and bus lines serve the village, which was incorporated in 1911. The retail trade in 1929 amounted to $8,683,283. Pop. 1920, 4,371; 1930, 11,993.

LYNCHBURG, a city in south central Virginia, an independent city in Campbell Co. It is situated on the James River, 125 mi. southwest of Richmond. Airplanes, bus and truck lines, river craft and three railroads serve the city. Boots and shoes are the principal manufactures. In 1929 the total factory output was worth about $31,000,000; the retail trade amounted to $21,698,677. Lynchburg ships large quantities of dark leaf tobacco. The city is the seat of Randolph-Macon College for Women, Lynchburg College, the Virginia Theological Seminary and College for Negroes, and Virginia Episcopal School for Boys. The village was organized by the legislature in 1786. Lynchburg was made a city in 1852. The Confederate Army used it as a supply base, and Lee surrendered to Grant 20 mi. east. Pop. 1920, 30,070; 1930, 40,661.

LYNDESAY or **LYNDSAY.** *See* LINDSAY, SIR DAVID.

LYNDHURST, a township of northeastern New Jersey, in Bergen Co., situated 3 mi. north of Newark, of which it is a residential suburb. It is served by the Delaware, Lackawanna & Western railroad. Lyndhurst is in a fertile farming district, and manufactures flooring, insulating material and machine-shop products. Blue stone quarries are in the vicinity. Pop. 1920, 9,515; 1930, 17,362.

LYNN, town and seaport, England. *See* KING'S LYNN.

LYNN, a city in Essex Co., eastern Massachusetts, situated as a port on Massachusetts Bay, about 10 mi. northeast of Boston. It is served by the Boston and Maine and the Revere Beach and Lynn railroads. One of the leading American manufacturing centers, Lynn is also a fine residential city, with a 2000-acre park and several good beaches. The manufacture of women's and children's shoes, leather and electrical supplies are the chief industries. Hundreds of other establishments also produce valuable commodities. In 1929 the total factory output was approximately $119,000,000; the retail trade amounted to $51,541,034. Harbor commerce in 1930, consisting chiefly of incoming coal, amounted to 352,422 tons. Lynn was settled in 1629 by Francis Ingalls, but was known as Saugus until 1637, when it was named for Lynn Regis, England. It was incorporated in 1850. Pop. 1920, 99,148; 1930, 102,320.

LYNWOOD, a city in Los Angeles Co., southern California, 10 mi. south of Los Angeles, served by buses and the Southern Pacific Railroad. Dairies and truck and poultry farms are in the vicinity. Lynwood is a residential community, with several factories producing gas valves, safety lines, auto tanks and hoists, oil machinery and candy. It is the seat of Lynwood-Compton Junior College. The city is ten mi. from Long Beach, a popular bathing and fishing resort on the Pacific. Lynwood was founded in 1911 and incorporated in 1921. Pop. 1930, 7,323.

LYNX (gen. *Lyncis*), a constellation covering a large area between Ursa Major, Auriga and Gemini but devoid of bright stars. *See* STAR: *map.*

LYNX (*Lynx canadensis*), a carnivorous animal of the cat family, found in northern and north temperate regions of North America and Europe. The true



LYNX OR AMERICAN WILD CAT

lynx has long legs, a short stumpy tail, tufted ears, and a beardlike tuft of hair on the cheeks. The paws are heavily furred, even between the pads. The color is light gray, usually without spots. One larger Amer-

ican specimen was 24 in. high, 34 in. long and weighed 35 lbs. The lynx feeds on ground game, having been known to pull down small deer. Being destructive to poultry and small farm animals, in most sections of North America it is under a bounty as a predatory animal.

The finest fur comes from Alaska and Canada. There is no black lynx and the fur so-called is dyed, and may be dyed bob-cat (*Lynx rufus*) or some other fur. This animal, sometimes mistakenly called lynx, red or bay lynx, is smaller and more spotted. It does not have the distinctive ear tufts and the tail has several dark bars above, with pure white below the tip.

LYON, MARY (1797-1849), American educator was born at Buckland, Mass., Feb. 28, 1797. She began teaching when only 17 and by means of this work and spinning and weaving in spare hours was able to save enough to continue her studies at Sanderson Academy, Ashfield, in 1817. Later she attended a seminary in Byfield, Mass., and was able to take a course in chemistry at the Rensselaer Polytechnic Institute at Troy. In 1828 she was associated with Miss Zilpah Grant, a former school friend, who had been made principal of a seminary at Ipswich. At this time there was practically no opportunity for women to receive a college education, and believing that women should have the same privilege as men to obtain a higher education Miss Lyon determined to open the way. By her own personal efforts, often making a house to house canvass, she was able after three years' struggle to raise $68,000, a sufficient sum to put up a few buildings. And in 1837 she opened Mount Holyoke Seminary (name changed to college 1893) at South Hadley, Mass. Recognizing that women of moderate means would need to have their expenses cut to a minimum, she arranged to have the domestic work done by the students. She was the head of the seminary until her death at Mt. Holyoke, Mar. 5, 1849. In 1905 she was elected to the American Hall of Fame. M. R.

See G. Bradford, *Portraits of American Women*, 1919.

LYONS, or **LYON,** a large industrial city at the meeting of the Rhône and Saône rivers in eastern France. It is the world's chief silk manufacturing city. Since the days when the Romans made it the trade center of the Rhône-Saône basin it has been a metropolis. The silk industry was introduced from Italy and was promoted by the French kings. After the Revolution it was given a new impetus by the invention of the loom by Jacquard. This industry now occupies about one-fourth of the population. In recent years artificial silk manufacture has been developed in the surrounding neighborhood, and dyeing and chemical industries have kept pace with the silk industry's needs. An international fair has been held annually since 1916. The textile museum of Lyons is one of the richest in existence. Metallurgical work and food products are among the other industries. The Crédit Lyonnais with headquarters in Lyons is one of the principal banks of France. The handsome city contains many fine buildings, a 12th century cathedral and Roman remains; the rivers are crossed by 24 bridges; the Pont Wilson was opened in 1918. The Roman emperors Claudius and Caracalla were born here, also the scientist AMPERE and the painters MEISSONNIER and PUVIS DE CHAVANNES. Pop. 1931,

LYONS, COUNCILS OF. Two synods, received as ecumenical by the Roman Catholic Church, were held at Lyons, France, in the 13th century. The first was called by Pope Innocent IV in 1245. Its chief objects were the dethronement of the Emperor Frederick II, and promotion of the Crusades. The council also decreed the wearing of red hats by cardinals. The second Council of Lyons was convened by Gregory X in 1274, principally for the purpose of effecting a reunion between the Latin and Greek churches. Although an agreement on the most important problem, that of the *filioque,* was apparently concluded, no actual healing of the schism resulted. Several important measures affecting papal elections were passed by this council.

LYRA (gen. *Lyrae*), the lyre, a small but interesting northern constellation and a conspicuous feature of our summer skies, passing overhead during early evenings in July and August. Alpha Lyrae, or VEGA, is the brightest star of the northern hemisphere, and white in color. Nearby to the east of Vega is the interesting quadruple star Epsilon Lyrae, which some persons can see double with the naked eye. Beta Lyrae, of the third magnitude, is an interesting ECLIPSING BINARY where the two components, ellipsoidal in shape and almost touching, revolve around each other in 10 days. Lyra occupies that part of the heavens toward which our solar system is speeding at 13 miles per second. *See* STAR: *map.*

LYRE-BIRD (*Menura superba*), a handsome passerine bird of southern Australia. It is nearly 3 ft. in length, with a large head, rather long neck, a long, conical, sharp-pointed bill, powerful legs and feet, and plumage of a general brownish color varied with reddish. The male is strikingly characterized by the unusual form of its tail, which is composed of three kinds of feathers. Those of the conspicuous outer pair are curved in the form of a lyre; the two very long central feathers are vaned only on one side, while the other inner feathers have slender flowing shafts with widely separated hairlike barbs. Exceedingly shy in disposition, lyre-birds move in pairs, inhabiting tangled undergrowth and running with extreme rapidity when startled. They feed chiefly upon insects, worms and mollusks, and build a large, domed nest, laying a single dark colored egg. The male sings well and also imitates the notes of various other birds.

LYRIC, a type of spontaneous non-narrative poetry, expressing in brief form some passionate inner feeling, and so named by the ancient Greeks because it could be sung to the lyre's accompaniment. Of ancient lyric poets, the greatest were Sappho, Alcaeus, Pindar, Bacchylides, Horace, Catullus (*see* separate

articles on these authors), Alcman, Stesichorus, Anacreon, Tibullus and Ovid. After the Dark Ages, lyric poetry blossomed forth again under the influence of the troubadours, achieving its finest flower in Italy under Dante and Petrarch, and in France under François Villon. (*See* articles on these poets.) In England the lyricism of the 14th and 15th centuries culminated in the Elizabethan Age with SHAKESPEARE, and was supreme again in the 18th and 19th centuries with Gray, Chatterton, Collins, Wordsworth, Keats, Shelley, Tennyson and Browning. Of American lyrists, perhaps the outstanding have been Emily Dickinson (1830-86), Elinor Wylie (d. 1928), and Edna St. Vincent Millay (1892-). *See also* POETRY.



COURTESY M.

THE LYRE PLAYER
Section of a 6th century Greek kylix, or drinking cup

LYSANDER (?-395 B.C.), one of the greatest Spartan generals, brought the PELOPONNESIAN WAR to an end in 405 B.C. by defeating the Athenian fleet off Aegospotami. In the next year he entered the city of Athens as a conqueror. Lysander then began laying plans for making himself virtual master of the Spartan state, but was killed in battle at Haliartus, Boeotia, in 395 B.C.

LYSIAS (c. 458-c. 380 B.C.), Greek orator, was born about 458 B.C. He was a flourishing tradesman till middle age, owning a shield-factory near the Piraeus. Owing to confiscations under the Thirty Tyrants in 404 B.C., he was reduced in circumstances. Later he became celebrated as a writer of speeches to be delivered in court. His style was something new, graceful and quiet, expressed in the idiom of everyday life. It had great influence on later Greek prose. Some of his works contain vivid pictures of the time. The orator died about 380 B.C.



THE HERCULES OF LYSIPPUS
In the Naples Museum

LYSIPPUS, the last of the six great Greek sculptors, favorite sculptor of Alexander the Great, in the 4th century B.C. At first a metal worker, he taught himself by studying the graceful figures of the Olympic athletes and especially the *Doryphorus* of Polyclitus, supposed to be a perfect model. Lysippus, however, made his figures more slender and the head smaller in proportion, and his influence can be traced throughout the Hellenistic period. His bronze statues numbered 1,500, including many portrait busts of Alexander the Great. Some of his statues were colossal, some mere statuettes. None of his originals have survived. Several in Constantinople were melted down for coin by a Doge of Venice in the 13th century. Some extant marbles are thought to be copies of his bronze.

LYTTON, EDWARD ROBERT BULWER-LYTTON, 1st EARL OF (1831-91), English diplomat and poet, the only son of Bulwer-Lytton, the author, was born in London, Nov. 8, 1831. In 1850 he entered the diplomatic service as attaché to the British embassy at Washington, D.C., holding various diplomatic posts until 1876, when he was appointed governor general of India. During his viceroyalty, Queen Victoria was made Empress of India. Severe trouble with Afghanistan also marked his tenure of office, war with that country breaking out in 1878. Two years later Lytton resigned, returned to England and was created an earl. He was later appointed British ambassador in Paris, a post he retained until his death. Under the name of Owen Meredith he is perhaps as well-known as a poet as he is as a diplomat. Lord Lytton died in Paris on Nov. 23, 1891.

LYTTON, EDWARD GEORGE EARLE LYTTON, BULWER-LYTTON, 1st Baron (1803-73), British novelist and statesman, was born in London, May 25, 1803. He was educated at Trinity College, Cambridge. Bulwer-Lytton received an extraordinary contemporary reputation as a novelist. Some of his best known novels are *Eugene Aram,* 1832, THE LAST DAYS OF POMPEII, 1834, *Rienzi,* 1835, *Zanoni,* 1842, *Harold,* 1848, and *Kenelm Chillingly,* an autobiographical novel, 1873. His most famous play was RICHELIEU, produced in 1839. Bulwer-Lytton entered politics early in life and became a member of Parliament in 1831; he was made a baronet in 1838, and was appointed Colonial Secretary in 1858. The statesman-novelist died in Devonshire, Jan. 18, 1873. Although Bulwer-Lytton's popularity declined considerably after his death, some of his historical novels, especially the *Last Days of Pompeii,* are still widely read.

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M

MAARTENS, MAARTEN (1858-1915), Dutch novelist whose real name was Jozua Marius Willem van der Poorten-Schwartz, was born in Amsterdam in 1858. His early life was spent in England and Germany and he studied law at Utrecht, where later he settled permanently. Maartens wrote in English, and his works were afterwards translated into Dutch. His earlier novels include *The Sin of Joost Avelingh,* 1890, which gained recognition because of its well-constructed story; *A Question of Taste,* 1891, showing an even more polished technique; *God's Fool,* 1892; and *The Greater Glory,* 1894, which effectively established his reputation. His later works, such as *Brothers All,* 1909, and *Eve,* 1912, possess especially strong moral implications. Maartens died at Utrecht in 1915.

MAASTRICHT or **MAAS-TRECHT,** capital of the Dutch province of Limburg, located at the confluence of the Jaar and the Maas. The city has two handsome squares, the Brijthof and the large Market Place. On the former is the Romanesque-Gothic cathedral of the 11th-15th centuries with a statue of Charles the Great, two crypts, a reliquary of the 12th century and many fine paintings by Van Dyck and others. In the market place is the old Church of Our Lady, late-Romanesque of the 11th century. Maastricht, once one of the best fortified cities in Europe, has a park, theater, various vocational and other schools and the municipal library, once belonging to the former Franciscan Church. The Pietersberg in the south of the city has been worked as a quarry for more than 1,000 years and has underground passages extending many miles in length. The chief manufactures are glass, crystal and earthenware, also carpets, nails and other goods. There is a heavy trade in grain, butter and transit goods. The Trajectum ad Mosam of the Romans, it was ruled in the Middle Ages conjointly by the dukes of Brabant and the bishops of Liége until the time of Charles V. It was held later by the Spaniards, by Prince Frederick Henry of Orange, three times by the French and once by the Swedes. Pop. 1930, 59,998.

MABINOGION, the title of a collection of 11 Welsh prose tales, from the 14th century *Red Book of Hergest,* published by Lady Charlotte Guest in 1838. The tales deal chiefly with the ARTHURIAN LEGENDS.

MACADAM, JOHN LOUDON (1756-1836), Scottish highway engineer and inventor, was born at Ayr in Scotland, Sept. 21, 1756. He became interested in highway construction and experimentation convinced him of the effectiveness of broken stone as the base for road material, hence the name "macadam." His system came into general use on the Continent after he had published his conclusions in an *Essay on the Repair and Preservation of Roads,* 1819. Macadam died at Moffat in Dumfriesshire, Scotland, Nov. 26, 1836.

MACADAM ROADS, roads constructed of broken stone. Such stone, or "road metal," was used in the middle ages, but the modern technique was developed under Tresaguet in France, 1750; and by McAdam and Telford in England, 1825. The macadam road was built of layers of broken stone thoroughly compacted. At the surface, smaller stones were worked into the voids of the underlying layers, and the whole finally choked with stone screenings, sand, clay or other fine granular particles, and rolled with a heavy roller after thorough wetting. The telford pavement began with a base of hand set stone blocks six to twelve inches in area, rolled firmly into the subgrade and on this smaller broken stone was compacted.

To resist the abrasion of the traffic, relatively thin surfaces are satisfactory, but in order to spread the loads over the more plastic soil, telford and macadam pavement are laid 10 to 12 inches thick. Such pavements can be no better in their load carrying qualities than the underlying soil which supports them. To be satisfactory, the subgrade must be drained and stabilized with the same care as is necessary for good EARTH ROADS or for a GRAVEL ROAD. Macadam and telford roads belong to the era of horse drawn traffic and hand labor construction. They are still useful as bases but rarely appear in new construction.

W. W. H.

MACALESTER COLLEGE, a coeducational institution at St. Paul, Minn., was the outgrowth of two academies founded by the Minnesota pioneer missionary, the Rev. Edward Duffield Neill. Property given by Charles Macalester of Philadelphia aided the development of the college. It was opened by the Presbyterian Church of Minnesota as a denominational institution in 1885. The productive funds in 1931 amounted to $1,364,759. The library contained 20,000 volumes. In 1931-32 there were 521 students, exclusive of the Conservatory of Music, and a faculty of 40, headed by Pres. John Cary Acheson.

MACAO, the only Portuguese colony in China, occupying an area of 11 sq. mi. on the peninsula of Macao in the Canton delta region. The Portuguese established a trading post at Macao in 1557, and during the 18th century Macao was the chief center of western trade in South China waters. The Portuguese paid a nominal rental to the Chinese government until 1849 when they declared the independence of the port. In 1887 a Sino-Portuguese treaty was signed recognizing the perpetual inalienable occupation of Macao by the Portuguese. After its decline as a commercial port, Macao became an

opium and gambling center and a large part of the revenues were derived from these sources. In recent years an attempt has been made to improve conditions. New port works have been built, new roads constructed and more orderly commercial life has been encouraged. Macao is a free port and still serves as an important trade distribution center. Rice, lumber, piecegoods, flour and ironware are the more important goods handled. Firecracker making is one of the principal local industries. In 1930 the population was approximately 160,000, of whom 4,500 were foreigners and the rest Chinese.

MACAQUE, any monkey of the genus *Macaca,* allied to the baboons. The group is wholly Asiatic except one, the magot, of Barbary and Gibraltar, the so-called Barbary ape. Macaques vary in size from 13 to 35 in., are plainly colored, active, noisy, fond of rocks, eat everything, and raid gardens in flocks. The best known is the common yellowish Bengal or rhesus monkey of India and eastward, regarded as sacred by many Hindus, and the favorite model of Japanese artists. Macaques are easily tamed, breed well in captivity, and are the commonest monkeys in zoos and trained-animal troops.

MACARONI. *See* PASTES, ALIMENTARY.

MACASSAR, or Makassar, a city of the Dutch East Indies, capital of the island of Celebes and its dependencies. The principal port, it is situated on the east coast of the island and is well-built and protected by ramparts and two forts. Macassar is one of the most important commercial centers of the Dutch East Indies, being the distributing center for the imports not only for the Celebes, but for Dutch New Guinea, the Moluccas and the Lesser Sundas. It has wide streets and several noteworthy buildings and monuments. The chief exports are coffee, rice, lumber, coconut oil, rubber and mother-of-pearl. Est. pop. 1931, 53,000.

MACAULAY, THOMAS BABINGTON, LORD (1800-59), British author and statesman, was born in Leicestershire, Oct. 25, 1800. His father was Zachary Macaulay (1768-1838), a West Indian merchant who belonged to the so-called "Clapham Sect" of evangelicals and was well-known as a philanthropist, interested in the abolition of slavery. The elder Macaulay's finances suffered and his distinguished son had to face "the eternal want of pence." In 1818 Macaulay entered Trinity College, Cambridge, where he ignored science and mathematics, devoting himself to history and literature. He was a conspicuous member of the Union Debating Society, carried off several university prizes and won a fellowship. Called to the bar, he preferred politics. In 1825 his essay on John Milton in the *Edinburgh Review,* a famous example of fine writing, established his prestige. Brilliant in conversation and encyclopedic in his survey of human life, he entered Parliament in 1830 and achieved success in debate. Seriously impoverished, he proceeded to India as legal advisor to the Supreme Council at a salary of £10,000, returning in 1838. Next year he was again in Parliament and joined Lord Melbourne's Cabinet as Secretary for War. But his real devotion was to his pen. He produced a classic series of essays; *The Lays of Ancient Rome* and other poems on martial themes; and a noted *History of England* which begins with the Revolution of 1688 and was only carried up to the death of King William. Infinitely careful over fact and phrase, Macaulay wrote frankly as a Whig, and revelled in epigram and antithesis. His verdicts, therefore, are sometimes disputed. It was in his own style that he excelled and few historians have ever captured a wider public. In 1857 Macaulay was created a peer and, dying on Dec. 28, 1859, was buried in Westminster Abbey.

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MACAW, the name given to numerous large parrots (chiefly of the genus *Ara*) native to Central and South America. They are handsome birds with very long tails, strong, hooked bills and usually brilliant plumage of sharply contrasted colors, reds, yellows, greens and blues being predominant. Arboreal in habit, they frequent the borders of forests, feeding chiefly upon nuts, hard fruits and seeds which they crush with their powerful bills. They lay usually two eggs in nests in hollow trees, both sexes assisting in incubation. One of the most handsome species is the blue-and-yellow macaw (*A. ararauna*), of tropical America, frequently seen in zoological gardens and menageries. It is about 2½ ft. long, with the plumage blue above, olive-green on the forehead and yellow-orange below. Other well-known species are the red-and-blue macaw (*A. macao*), found from Mexico to the Amazon valley, and the red-and-green macaw (*A. chloroptera*), ranging from Panama to the Amazon. Although frequently kept as ornamen-



COURTESY AMER. MUS. OF NATL. HISTORY

MACAW FROM BARRO COLORADO ISLAND, PANAMA

tal pets, macaws are less easily tamed than other parrots, screaming violently when disturbed and never learning to speak well.

MAÇAYÓ. *See* MACEIÓ.

MACBETH, a tragedy of two souls destroyed by ambition, by SHAKESPEARE, possibly written as early as 1605, acted in 1610. It is based chiefly on Holinshed's *Chronicle of Scottish History,* 1577. Macbeth and Lady Macbeth, whose historical prototypes lived in the 11th century, are so consumed with the ambition to become rulers of Scotland that they are driven to murder the old king, Duncan, and the faithful noble, Banquo. Thus they gain the throne, but only to pay for it in misery, for Lady Macbeth, who has largely instigated her husband's crimes, tortured by conscience, goes mad and dies wretchedly, and Macbeth himself, in a battle into which evil portents have drawn him, finds a tragic end. The play reaches the summit of horror in Lady Macbeth's famous sleep-walking scene, and is heightened in its sinister effect by the frequent appearance of ghosts and witches. *Macbeth* is Shakespeare's shortest drama.

MACCABEES, originally the surname (in the plural) of Judah, the son of Mattathias; it was later applied also to Judah's four brothers, Eleazar, Simon, Jonathan and Johanan, who played a prominent rôle in the Jewish war against the Syrians, 168-165 B.C. Still later the surname Maccabee was extended to include all the descendants of Mattathias, who formed the Hasmonean dynasty, as well as all those Jews who participated in the Hasmonean revolt against Syrian domination.

The name Maccabee is said to be derived from the Hebrew word *makkab,* meaning hammer, and was used in reference to Judas Maccabeus, who crushed the forces of the Syrian King Antiochus IV (Epiphanes), with sturdy, hammer-like blows. Others derive it from the first letter of each of the four Hebrew words meaning "Who Is Like Unto Thee Among the Mighty, O Lord" (*Mi Kamocha Baelim Adonai*), which device Judas Maccabeus was believed to have had emblazoned on his banner. The exact origin of the name is doubtful. In the two pre-Christian centuries, the Maccabees, themselves descended from a renowned priestly family, produced nine kings and high priests in six successive generations.

The original purpose of the Maccabees' struggle was religious, that of securing from the Syrians the right to practice freely the Jewish religion. After religious freedom had been obtained in 165 B.C., the Maccabees determined to gain political independence from Syria as well. In this they succeeded three years later, under the able guidance of Jonathan the Maccabee, 161-143 B.C., and Simon the Maccabee, 142-135 B.C., despite the apathy and opposition of a portion of the people. Simon was later elected prince and high priest by the entire nation, and his rule was proclaimed to be hereditary. His son, John Hyrcanus, 135-104 B.C., extended the power and boundaries of the Jewish people, despite the rift caused by the beginnings of the violent disputes and dissensions between the SADDUCEES and the PHARISEES, and by the twofold office of the Maccabees as king and high priest. From this time forth the Pharisees opposed the Hasmonean rulers, declaring that the rule belonged to the descendants of the tribe of David (Judah), whereas the Maccabees were only priests, descendants of the high priest Aaron, of the tribe of Levi. Thus Alexander Jannai, 103-76 B.C., had serious disputes with the Pharisees. After many years of almost unbroken civil wars, altercations and bloodshed, Rome intervened in the person of Pompey the Great, and the Jews lost their political independence for all time. Aristobulus II graced Pompey's triumphal chariot in Rome, and shortly after his death Herod I, the ally and tool of the Romans and the son of the Idumean Antipater, put an end to the male members of the Hasmonean dynasty in 37 B.C. when he had its last scions, Aristobulus III and Hyrcanus II, executed.

The four important books of the Apocrypha which recount the history of the period of the Maccabees and the great story of their struggles against the Syrians, were called I-IV Maccabees. A. SH.

See Graetz, *History of the Jews,* 1926.

MACCABEES (FRATERNAL ORDER), a secret society formerly known as Knights of the Maccabees of the World, founded in London in 1878 as a beneficiary organization. Within two years rival branches appeared in the United States and Canada. The order has since become one of the most popular and successful in the United States. The total membership in 1930 was well over 300,000 in about 5,000 lodges. The society bases its ritual on the traditions and history of the ancient Maccabean dynasty as recorded in the Apocryphal books of the Maccabees in the Old Testament. The Woman's Benefit Association of the Maccabees is the corresponding women's organization and operates as a mutual benefit society for women. It prides itself on being the largest fraternal benefit society for women in the world and numbered in 1930 about 3,000 lodges with a total membership of over 250,000.

MACCABEES, FEAST OF, the festival celebrated by the Jewish people in commemoration of the victory of the MACCABEES, in the war against Antiochus IV (Epiphanes), King of Syria, from 168-165 B.C., and of the rededication of the Temple at Jerusalem. The festival is usually called Hanukah, meaning rededication, also Feast of Lights. It begins on the 25th day of the month of Kislev, corresponding roughly to December, and lasts for eight days. The origin of the festival has its legendary association. There is the story of the only cruse of oil left undefiled by the Syrians and found in the Temple, which by some miracle lasted for the entire eight days required for the cleansing and rededication of the Temple; hence the fixation of eight days for the festival. This legend is not mentioned in I Maccabees and in Josephus, Antiquities 12, 7:7, the oldest sources for the story of the Maccabees (cf. also the eight days of Passover, the original eight days of the Feast of

Tabernacles, and the ancient significance of the number eight as the cube of two).

The Feast of Maccabees is a festival of joy and merry-making. A. SH.

See Graetz, *History of the Jews*, 1926.

MACCLESFIELD, a municipal borough of Cheshire, England, situated 166 mi. northwest of London on the banks of the Bollin, the valley of which is walled in by bleak heights rising to over 1,000 ft. Mentioned in the Domesday Survey, Macclesfield retains something of its ancient character. The old market cross and stocks are preserved in Victoria and Peel parks, and there are the restored church of St. Michael founded in 1278, and a 15th century chapel once attached to a college of secular priests. From the 16th to the early 18th century the manufacture of silk-covered buttons was of greatest importance and has developed into an extensive production of textiles. In the vicinity are slate- and stone-quarries. Pop. 1921, 33,846; 1931, 34,902.

MACCRACKEN, HENRY NOBLE (1880-), American educator, was born in Toledo, O., Nov. 19, 1880. He graduated in 1900 from New York University and took his Ph.D. at Harvard in 1907. From 1900-1903 he was an instructor in English at the Syrian Protestant College, Beirut, and in 1908 joined the faculty of the Sheffield Scientific School, Yale, where he was assistant professor of English until 1913. After a year as professor of English at Smith College, he was elected president of Vassar in 1914. MacCracken is the author of *First Year English,* 1903, a popular textbook; part author of *Manual of Good English,* 1917, and editor of *The College Chaucer,* 1913.

MACCRACKEN, JOHN HENRY (1875-), American educator and publicist, was born in Rochester, Vt., Sept. 30, 1875. He graduated from New York University in 1894 and took his Ph.D. at the University of Halle-Wittenberg in 1899. In 1896 MacCracken returned to New York University, where he taught philosophy until 1899. From 1899-1903 he was president of Westminster College, Missouri, and from 1903-15 was syndic and professor of politics at New York University. MacCracken was president of Lafayette University from 1915-26, when he resigned. He also served as president of the American Institute of Christian Philosophy and in 1930 became associate director of the American Council on Education.

MACDONALD, JAMES RAMSAY (1866-), British prime minister and Labor leader, was born at Lossiemouth, Scotland, Oct. 12, 1866, the son of a laborer. He received an elementary school education and by evening-school attendance increased his range of knowledge, while working as a clerk in London. He joined the Independent Labor Party in 1894, and by his activities in the trade union movement helped bring about, in 1900, the organization of a vigorous Labor representation in parliament. MacDonald entered parliament in 1906, and five years later was head of the Labor membership in the House of Commons. On the eve of England's declaration of war in 1914, he asserted that the country was not honor-bound to move against Germany. His pacifism was widely denounced, even by the Labor party. MacDonald resigned his leadership, and did not reenter parliament until 1922. In the general election of 1923, however, he led the Labor party 140 seats. Early the next year he formed a government assuming the premiership and the foreign secretaryship. As the leader of the first Labor government of Great Britain, there was much interest as to his policies. It soon appeared, however, that MacDonald was not a revolutionary. Besides, his tenure of office during both of his ministries depended on the Liberals and he therefore could not have carried through a socialist program of a radical character. Nevertheless he championed the cause of Labor at home as he did the cause of peace and international cooperation abroad. During his first term from January 1924 to November 1924, he joined with Herriot, the newly elected prime minister of France, in bringing about the evacuation of the Ruhr and in advocating the adoption of the Geneva protocol in the Assembly of the League of Nations. With the Conservative victory in the election of 1924, MacDonald retired to the opposition benches. At the end of the five years, however, he returned from the polls with the largest party in the Commons and again was asked to form a ministry. His second government as Labor leader lasted from June 1929, to the great financial crisis of 1931. Conspicuous among the problems were unemployment and the dole, an unfavorable trade balance, and the nationalist agitation in India and the India conference at London. In December 1931 the financial situation became so acute that severe measures were necessary and MacDonald with the cooperation of the Conservatives and Federals and the support of Snowden and a few others of his own party formed a national coalition ministry, dissolved parliament and carried the election against his former friends the Laborites led by Arthur Henderson. Thereupon he re-formed the national ministry, the Conservatives, backed by an overwhelming majority in the Commons, getting the largest representation. A leader of idealism and vision, strong convictions and fearless courage, Ramsay MacDonald's political career reflects in a most dramatic manner the conflicting changes in English life in the 20th century. W. C. L.

MACDONALD, SIR JOHN ALEXANDER (1815-91), first premier of the Dominion of Canada, was born in Glasgow, Scotland, Jan. 11, 1815. His family moved to Kingston, Ontario, where he studied law, was admitted to the bar, entered politics as a Conservative and represented Kingston in the Legislative Assembly. His rise in politics was rapid, becoming in 1854 attorney general, prime minister in 1857, and leader in the Assembly from 1864-7. Perhaps his most important work was in the Colonial Conference held in London 1866-7, where he strongly advocated the union of the various provinces in Canada, which was eventually accomplished in the formation of the Dominion of Canada. For the part he

took, he was made the first premier in 1878 and was active in adjusting differences that arose between the provinces, and also in the building of the Canadian Pacific Railroad. Macdonald was premier for 13 years, and was a dominant factor in Canadian politics and national development. He died June 6, 1891.

MACDONALD COLLEGE, at Ste. Anne de Bellevue, Quebec, Canada, a constituent body of McGill University, founded in 1907. It is coeducational and non-sectarian. Macdonald was endowed by Sir William C. Macdonald for the advancement of education and research, with special reference to rural problems and for the training of teachers for rural districts. It includes the School of Agriculture, School for Teachers and School of Household Science of McGill University. Its endowment fund in 1931 was $4,250,000. In 1930-31 there were 564 students, and a faculty of 68 supervised by Sir Arthur W. Currie.

MACDONOUGH, THOMAS (1783-1825), American naval officer, was born in Delaware, Dec. 23, 1783, and at seventeen joined the American navy. He served in the war against Tripoli on the *Philadelphia* (1803), but having been placed in command of a Moorish prize, escaped the fate of that vessel when she grounded and was captured in the harbor of Tripoli. The following year he was one of Decatur's party which burned the *Philadelphia.* In the War of 1812 he was assigned as first lieutenant on the *Constitution* and later placed in command of the American fleet on Lake Champlain, where by his splendid victory over the British fleet Sept. 11, 1814, he prevented the invasion of New York and Vermont by the British. For this he was promoted to the rank of captain. Died at sea, on board the *Constitution* of which he was commander, Nov. 18, 1825.

MACDOWELL, EDWARD ALEXANDER (1861-1908), American music composer and pianist, was born at New York, Dec. 18, 1861. The most important among his many instructors were Teresa Carreno and Karl Heymann for the pianoforte, and Savard and Raff in theory. At the age of 20 he became an instructor in the Darmstadt Conservatory, seven years later settling in Boston. In 1896 he was appointed head of the music department of Columbia University, and this post he occupied until 1904 when illness compelled his resignation. Cerebral complications ensued the following year. Struck down during middle life, he nevertheless left an impressive body of creative labor which would have been still greater save for his pianistic and pedagogical exertions. His best compositions exhibit a romantic imagination and a polished craftsmanship that placed him near the top of American composers. Among his more important works are two pianoforte concertos, four pianoforte sonatas, *Tragica, Eroica, Norse,* and *Keltic,* two pianoforte suites, and two groups of short pieces for the same instrument, *Woodland Sketches* and *Sea Pieces,* three symphonic poems, *Hamlet, Ophelia,* and *Lancelot and Elaine,* and two orchestral suites. He died at New York, Jan. 23, 1908.

MACE, a spice prepared by removing and drying the arillus, or covering, which surrounds the nutmeg seed. It is sold both whole and in powdered form.

MACEDONIA, a Balkan area of indefinite boundaries, stretching northward from the region of Saloniki to the Rhodope Mts., and extending to Albania on the west, and the Mesta River on the east. It is, on the whole, a mountainous district, but contains large and fertile valleys, particularly those watered by the Vardar and Struma rivers. Gold, silver, oil, wine and wheat have always been its main products.

Ancient Macedonia was inhabited by a people who spoke a Greek dialect and who may have remained in this country while the other Greeks pushed further southward. Although their kings claimed descent from Hercules, the Macedonians were not accorded recognition as racial kinsmen by the Hellenes. About 700 B.C. the scattered tribes of Macedonia were united under the family of the Argeadae, of whose history little is known. Slightly more than two centuries later the Macedonians were defeated by the Persians and forced to aid Xerxes in his attacks upon the Greeks. This subjection came to an end, however, after the defeat of the Persians at Plataea in 479 B.C.

Any potential commercial greatness which the Macedonians might have achieved was blocked by the colonizing activities of the Greek cities along the coasts, and by the cities on the three-pronged peninsula of Chalcidice. Accordingly periods of only moderate commercial prosperity and of civil war and confusion alternated in Macedonian history until the accession to the throne of Philip II in 359 B.C. Philip rapidly extended his control over the neighboring peoples, subduing both the Thracians and the Illyrians, and destroying many of the coastal cities. Before his death in 336 B.C. he was generally recognized as the leader of all the Greeks. His son Alexander the Great, 336-323 B.C., secured undying fame by conquering approximately half the then known world and extending his sway eastward as far as India. Following Alexander's early death, however, his vast possessions were divided among his generals, Macedonia falling to Antipater (d. 319 B.C.). Thereafter Macedonia was fated to engage in a long series of wars, with the neighboring cities, with the Aetolian and Achaean leagues, and finally with Rome. The Romans put an end to the power of the Macedonians by the defeat which they inflicted upon Philip V at Cynoscephalae in 197 B.C. In 146 B.C. Macedonia, together with Thessaly and part of Illyria, was converted into a Roman province. As such it was the scene of active and successful missionary labors by St. Paul, whose epistles to the Thessalonians and Philippians were addressed to inhabitants of Macedonia. After the division of the Roman Empire into a western and an eastern half, 395, Macedonia was incorporated in the Eastern or Byzantine Empire.

Conquered by Ottoman Turks. The province of Macedonia suffered from numerous barbarian invasions, being visited and plundered by the Goths,

Huns, Vandals and Avars. In the 5th and 6th centuries the land was overrun by Slavs. The region was conquered in the 9th and 10th centuries by the Bulgars under their Tsars Krum and Simeon; but the Byzantine Empire recovered possession thereof within another hundred years. So unsettled were conditions in the Balkans in the medieval period that the Eastern emperor was destined to lose and regain control over Macedonia several more times. The Christian Crusaders ruled it for a period in the 13th century, and in the 14th it came under the temporary domination of the Serbs under their valiant leader Stephen Dushan. Finally, during the period 1371-1430 the whole province was conquered by the Ottoman Turks who held it for the next five centuries, until the Balkan Wars of the 20th century. The local landholders were cruelly treated by the Turks, and while their land was given to Turkish chieftains, they themselves were often reduced to a state of serfdom. As a result, the 17th and 18th centuries witnessed a number of great migrations of people, especially Serbs, from Macedonia to some of the other Balkan regions where the misgovernment and mistreatment were less flagrant.

During the 19th century Macedonia, because of its peculiar geographic location, became the battleground for the conflicting nationalist aspirations of its three neighbors: Bulgaria, Greece and Serbia. Turkish control was weak, and these Christian states strove by various forms of propaganda methods, particularly through the instrumentality of churches and schools, to convince the Macedonian inhabitants that they were of Bulgarian, or Greek, or Serbian nationality. All three states advanced historic and racial claims to the area; but the Bulgarians were easily the most successful in spreading their special virus of nationalism. The Macedonia Question was complicated by the presence in the land of Rumanian Kutzo-Vlachs, Jews, Moslems and Albanians. Moreover, by the end of the century there also began to emerge a form of Macedonian national spirit expressed in the slogan "Macedonia for the Macedonians." A confused guerilla warfare kept the country in a state of perpetual chaos. In addition, the people were constantly stirred up by the activities and agitation of secret societies such as that founded by Boris Sarafoff at Sofia in 1900, and by the deeds of organized bands of Macedonian patriots or patriotic brigands called *komitadjis*. The situation became more than tragic when the sultan got into the habit of sending his emissaries to execute summary punishment upon the hapless inhabitants who were made to suffer for the sins of all their neighbors, as well as for their own.

In 1878 Russia, through the TREATY OF SAN STEFANO, had made Turkey agree to the incorporation of most of Macedonia in a Greater Bulgaria. But the Great Powers vetoed this disposition, and the CONGRESS OF BERLIN restored the province to the Sultan's control. After some particularly serious outrages in 1903, however, Russia and Austria-Hungary were delegated by the Concert of Europe to supervise the region. Accordingly, these Powers drew up the MURZSTEG PROGRAM for the policing and reformation of the area. This action improved matters a little but in no way solved the nationalities problem which, indeed, approached a crisis at the time of the Young Turk Revolution in 1908.

Balkan Wars. The Young Turks were imbued with a strong desire to Ottomanize the empire, and in accordance with this spirit proceeded to colonize Macedonia with Moslems, while at the same time exacting military service from all inhabitants who were unable to purchase their exemption. This led to the voluntary exile of thousands of the residents and consequently to an even greater longing on the part of the Christian neighboring states to acquire Macedonia. This desire became quite apparent in 1912 when Serbia and Bulgaria signed a treaty and then a military convention which contemplated a war on Turkey and the subsequent division between the allies of Macedonia. Greece and Montenegro were induced to become partners to the scheme for an attack on Turkey and in the same year, 1912, the First Balkan War (*see* BALKAN WARS) broke out.

Turkey was defeated by the League which thereupon broke up in a quarrel over the spoils. It happened that during the war Bulgaria had fought chiefly in Thrace, while the Serbs and Greeks had been active in Macedonia. Moreover, Austria-Hungary and Italy blocked Serbia's aspirations for a seaport on the Adriatic. Consequently Serbia refused her consent to Bulgaria's acquisition of the northern part of Macedonia as had been agreed upon in the treaty of 1912. Bulgaria insisted upon her share according to the pre-war bargain, and the Second Balkan War was precipitated. As a result of this conflict Bulgaria had to be contented with a small part of northeastern Macedonia, while Greece secured the fertile stretches along the Aegean Sea and Serbia got the Monastir section.

The Second Balkan War was merely a prelude to the WORLD WAR during which Bulgaria and Turkey fought on one side, and Greece and Serbia on the other. Since the latter Powers were allied with the victors, their desires with respect to Macedonia were completely achieved after the war. The much harassed province was practically divided between them, and Bulgaria lost most of what little she had gained in 1913. An "unredeemed Bulgaria" thus was created which was conducive to anything but future peace in the Balkans.

Moreover, thousands of Macedonians who had come to regard themselves as Bulgarians, or who were oppressed by the Jugoslavs and Greeks, or who wanted to establish an independent Macedonia, now flocked into Bulgaria. Here they established a base from which to carry on irredentist activities against both Greece and Yugoslavia. Naturally the Bulgarian Government, which was disarmed by the peace treaty and too weak to check the deeds of the armed *komitadjis*, was bound to become embroiled once more with her two neighbors. In 1925 a Greco-

Bulgarian border incident almost led to war, being settled peaceably only because of energetic intervention by the League of Nations. Then, in 1927, a Serb general was murdered by Macedonian agitators, with the result that Yugoslavia closed its borders to Bulgarians for more than a year.

Conditions improved slightly when Bulgaria and Greece came to an agreement in 1929 for the voluntary exchange of populations, and when Bulgaria and Yugoslavia came to an agreement on frontier regulations and land disputes in 1930. Nevertheless the problem of Macedonia, involving as it does the clashing interests and aspirations of the rather volatile Greeks, Bulgarians, Yugoslavs and Macedonians, remains as one of the most dangerous of European sore-spots. W. C. L.

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MACEDONIAN, an extinct INDO-EUROPEAN language spoken in the area roughly corresponding to modern Macedonia, and preserved only in glosses of very mixed provenance. Its linguistic affinities are quite uncertain, but it may possibly have been a branch of ILLYRIAN.

BIBLIOGRAPHY.—O. Hoffmann, *Die Makedonen, 1906.*

MACEIÓ, also Maçayó, a city in the state of Alagoas, Brazil. Maceió, in 9° 40′ S. lat., is situated on a peninsula between the Lagoa do Norte and the sea, on which its port, Jaragua, is located. The public buildings, of which there are a cathedral, government building and lyceum, are built of broken stone; its homes are lightly constructed and plastered with mud. Cotton goods are manufactured and there are extensive coconut plantations near by. Pop. 1920, 74,166; est. pop. 1930, 103,930.

MACERATA, a city of Italy, capital of the province of the same name, situated between the Chienti and Potenza rivers, in east central Italy. It has old city walls and towers of the 13th century, several interesting churches and palaces, a university founded in 1290, advanced schools, technical institute, agricultural and trade schools, a library and a museum. Chief industries are silk-spinning and the manufacture of paper and macaroni. A little more than a mile southeast is the beautiful Church of Santa Maria delle Vergine, 16th century, and near-by the ruins of Helvia Ricina, founded by Septimus Severus. Pop. 1931, 26,422.

MACFARLAND, SIR JOHN HENRY (1851-), British educator, was born in Omagh, Ireland, Apr. 19, 1851. He was educated at Queen's College, Belfast, where he was a Gold Medallist student; and at St. Johns, Cambridge, where he was wrangler in the mathematical tripos. After serving as assistant master at Repton from 1876-81, and master of Ormond College from 1881-1914, he became vice-chancellor of the University of Melbourne, Australia, and in 1918 was elected chancellor. MacFarland became a member of the University Council in 1886, and was knighted in 1919.

MACHADO DE ASSIS, JOAQUIM MARIA (1839-1908), Brazilian author, was born in Rio de Janeiro in 1839. He came of poor parents and was early beset with difficulties. Yet the very nature of the work that he was forced to take up, for example, that of a typesetter, brought him into contact with the surroundings and the persons that were to suggest his real career. It was at literary meetings and in the book shop of Paulo Brito that he awoke to his calling. At 20 he began to write with the opportunism and the prolixity of the eager prentice hand; comedies, tales, translations, poems, flowed with equal steadiness from his pen. His talent, though evident, was slow to develop; it could be seen that he had a gift for understanding the inner workings of the human soul and that by nature he was an ironist. His best productions, which range over an activity of 30 years, are of the head rather than of the heart; a classical repose balances his innate pessimism. When, in 1897, the Brazilian Academy of Letters was founded, Machado de Assis was elected President and retained that distinction up to the time of his death. France honored him with a memorial celebration at the Sorbonne, Paris, in the Richelieu amphitheater, on Apr. 3, 1909. Here ANATOLE FRANCE, to whose literary family the noted Brazilian belongs, delivered an address on The Latin Genius.

The poetry of Machado de Assis appears in four collections: *Chrysalides,* 1864; *Phalenas,* 1870; *Americanas,* 1875, and *Occidentaes,* posthumous, 1900. Love and a passion for international injustice inform the first book; the second, more varied, adds to these qualities a sense of humor and of the exotic; in the third, as the name would suggest, he seeks inspirations in native scenes and legends. It is in *Occidentaes* that he achieves, as poet, his full stature, expressing to the full his tender irony, his repressed sensuality, his disillusioned comprehension of illusions, his admirable feeling for poetic form. This same world-weariness runs through his prose works, in which his withdrawn personality achieves its finest expression. His short stories are distinguished for description that is also sensation. His novels are such only by definition, the best known of them being *Braz Cubas* and *Dom Casmurro.* His earlier ones belong to the romantic epoch, and are hardly characteristic of his essentially anti-romantic spirit. *Braz Cubas* and *Dom Casmurro* are to be read least of all for plot; they are the quintessence of whimsy that is instinct with a sense of man's futility. Machado de Assis has been likened, for his humor, to LAURENCE STERNE; remove the connotation of ribaldry, retaining that of fruitful rambling, and there is a basis for the comparison. The writer died in 1908, at Rio de Janeiro. I. G.

BIBLIOGRAPHY.—I. Goldberg, *Brazilian Literature,* 1922.

MACHADO Y MORALES, GERARDO (1871-), President of Cuba, was born at Santa Clara, Cuba, Sept. 29, 1871. He fought in the revolutionary war and afterwards resigned and founded the tobacco firm of Ramos, Machado y Cia. Machado entered

public life as Mayor of Santa Clara and remained in this office until the proclamation of the Republic. In 1908 he became governor of Santa Clara Province, and the following year, secretary of the Provincial Government. In 1925 he succeeded Zayas as President of Cuba. He was reelected on May 20, 1929.

MACHADO Y RUIZ, ANTONIO (1875-), Spanish poet, was born at Seville, July 26, 1875. The brothers Manuel and Antonio Machado, sons of Antonio Machado (1846-93), a distinguished Andalusian folklorist, have both written poetry. The more gifted Antonio, called "mysterious and silent," has an aloofness and subtlety in his work, which is singularly unlike that of any other contemporary poet. His *Canciones y dedicaciones,* 1914, particularly emphasizes these qualities.

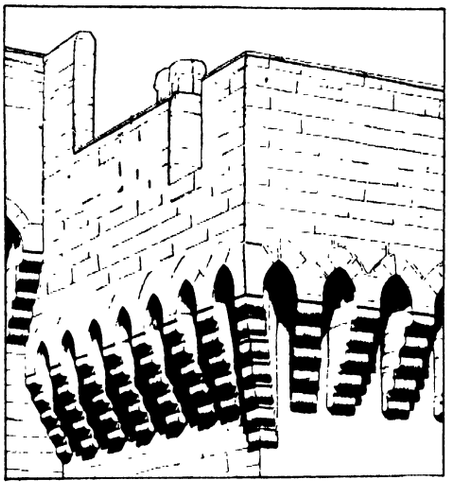
MACHAR, JAN SVOTOPLUK (1864-), Czech poet and man of letters, was born at Kolin, Bohemia, in 1864. He was one of the chief literary spokesmen of his generation, as well as a popular poet. Noteworthy among Machar's works are *Confiteor,* 1887, containing his early lyrics; *Roses Blossom,* 1894, a lyrical drama; *Magdalen,* 1894, an epic poem; and *Warriors of God,* a political satire. His most ambitious work is *The Conscience of the Ages,* 1893-96, a cycle made up of seven collections of short poems and revealing the development of mankind from China and ancient Greece down to the present.

MACHAUT, GUILLAUME DE (1300-c. 1377), French troubadour, also known as Guillermus de Mascandio, was born in 1300 at Machault, in the Ardennes. From 1330-60 he was private secretary to John, King of Bohemia, who procured him many ecclesiastical sinecures. The troubadour's nostalgia for France is a constant theme of his writings. At the king's death he entered the service of the ruler's daughter; and when her husband, Jean le Bon, succeeded to the French throne, he endowed Guillaume with sufficient means to carry on his poetry and music. He returned to Machault, where he died about 1377. Machaut's works include *Le confort d'ami* and *Le Dit du Lyon.* Among his musical compositions are motets for 2 and 3 voices, rounds, ballads and a Mass.

MACHIAVELLI, NICCOLO (1469-1527), Italian patriot, historian and political writer. The son of a Florentine lawyer he entered politics in Florence, continuing active in public affairs until the return of the Medici faction in 1512 compelled him to retire. During this period of enforced inactivity he devoted himself to writing. Gradually gaining the favor of the Medici party he again became active in politics but was compelled to retire once more on the expulsion of the Medici in 1527 and died the same year. His political treatise, *The Prince,* has given him an undeservedly sinister reputation. An ardent Italian patriot, he hoped for the establishment of a strong national monarchy under a monarch who must have no scruples but make the end justify the means. These means he sets forth in *The Prince.* In *Discourses upon Titus Livius* he advocates the old Roman idea of a state-controlled society, with state control of religion and morals. The *Florentine History,* from the barbarian invasions to 1492, was written at the request of Cardinal de Medici. To Machiavelli the purpose of history is interpretation, not the mere cataloging of events. He is at his best in describing the inner history of Florence in 1420.

BIBLIOGRAPHY.—P. Villari, *Life and Times of Niccolo Machiavelli,* translated by L. Villari, 3rd ed., 3 vols., 1912-1914; N. Machiavelli, *The Prince,* Everyman's; N. Machiavelli, *Florentine History,* Everyman's.

MACHICOLATION, the term used to denote the series of holes cut for the discharge of missiles in the bottom of a projecting gallery in a medieval fortress, and hence applied to the gallery, when thus perforated, itself. The first machicolations were those of the temporary wooden hoardings (Fr. *hourdis*), such as may be seen on the towers of the castle in



MACHICOLATION OF THE TOWN WALLS, AVIGNON, FRANCE

the cité of Carcassonne. Toward the end of the century these were replaced by permanent parapets, first over gateways and in strategic positions, and then in the form of complete *chemins de ronde,* or continuous passages along the top of the walls. The finest example is that of the Chateau of Pierrefonds, France, dating from the early 15th century.

See Viollet-le-duc, *Dictionnaire raisonné de l'Architecture,* article Machicoulis.

MACHINE, a term applied in general to any mechanical contrivance. In mechanics, the term is used of devices for the conversion of motion as the lever. Machines which convert molecular motion into mechanical motion are termed engines or motors. Usually, the term machine is applied to the more complicated contrivances, while the term mechanism designates the simpler ones.

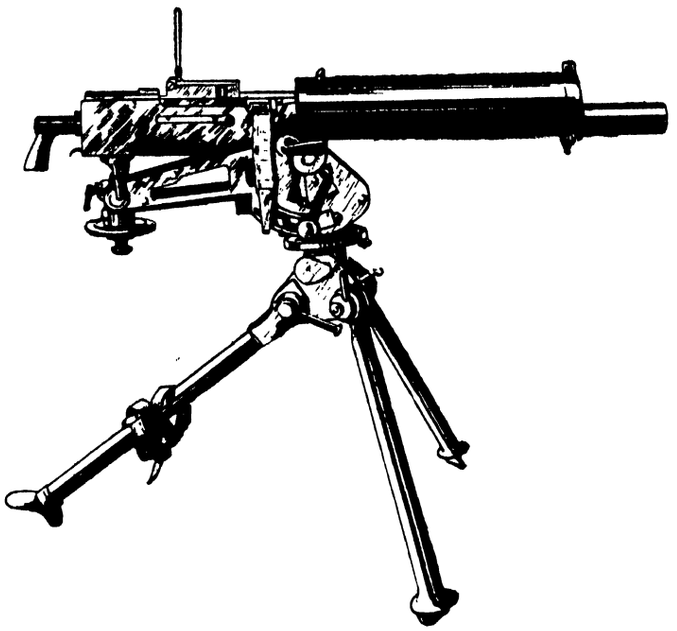
MACHINE BELTING. *See* BELTING.

MACHINE GUN, an automatic small caliber rifle with a high rate of fire. Several types have been produced, distinguished from each other by the methods of securing the automatic action.

The Vickers type used in Great Britain, and the Browning type used in the United States, are operated by the recoil of the barrel. The Hotchkiss type used in France, the Madsen type used in Scandinavia, the

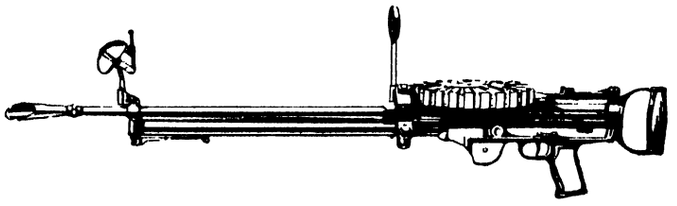
Lewis type (*see* LEWIS GUN) used by the Allies to a considerable extent during the World War, operate from the gas released from the barrel.

Machine guns are adapted to a variety of uses. Light types are used by soldiers in the line companies



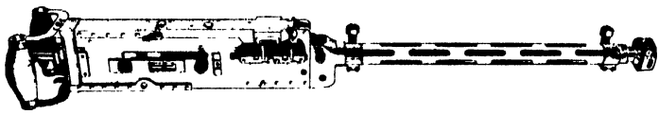
BROWNING HEAVY MACHINE GUN ON A GROUND TYPE MOUNT

of infantry and cavalry and are sometimes called machine rifles; heavy ground types are used by special machine gun organizations; aircraft types are used in airplanes; antiaircraft types are used by ground troops against flying aircraft.



LEWIS AIRCRAFT MACHINE GUN

Light types are usually air cooled and are fed from drums, strips or magazines, containing 50 to 100 rounds of ammunition, which can be readily carried by soldiers and fired at a rate of 200 to 400 shots per minute in short bursts of fire. Heavy types are usually

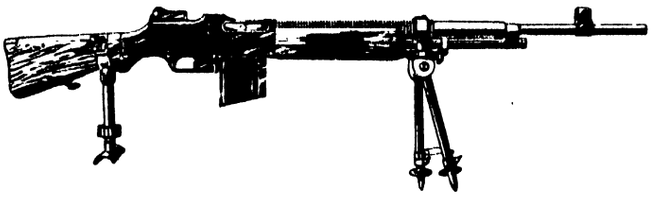


BROWNING AIRCRAFT MACHINE GUN

water cooled and are fed from belts or large magazines. Belts may contain 500 to 1,000 rounds each and are carried in specially constructed boxes. They fire at a rate of 400 to 600 rounds per minute continuous fire. Aircraft types are air cooled and are either flexible when they are used in the cockpit or on the wings and aimed in any direction by their operators, or synchronized when they are fixed on the fuselage and fire through the propeller. They fire at rates from 600 to 1,200 rounds per minute.

Antiaircraft machine guns are usually water cooled and are fired from special high angle carriages, either singly or in multiple, at rates from 400 to 600 rounds per minute.

C. G. M.



BROWNING MACHINE RIFLE, U.S. TYPE

MACHINE RIFLE, a designation given during the World War to several varieties of light aircooled MACHINE GUNS.

MACHINERY, STAGE. *See* STAGE MACHINERY.

MACHINE SHOP PRACTICE may be defined as the selection of the proper tools for the economical manufacture of the product to be made. Fifty years ago it was only necessary to consider a comparatively few simple MACHINE TOOLS, such as the LATHE, PLANER, SHAPER, DRILLING MACHINE and a few special modifications of these. While both the MILLING MACHINE and GRINDING MACHINE were in existence, their use was limited. Machine shop practice to-day however must include consideration of many types of lathes, both automatic and semi-automatic, as well as developments of the turret lathe and its adaptation to many fields. Much plane surfacing work that was formerly done on the planer or shaper is now down by specially designed milling machines. Grinding machines, too, have become standard equipment for many surfacing operations on both plane and cylindrical surfaces.

Gear cutting (*see* GEAR CUTTING MACHINES), formerly done on the standard milling machine or special planer or shaper, is now done with great rapidity and accuracy on machines that have been developed for this purpose. Drilling operations have graduated from the old single spindle upright drilling machine to highly developed mechanisms with, in some cases, over a hundred spindles, which drill a multitude of holes of various sizes, at a single operation, on three, four or five sides of a piece of work, as e.g., in an automobile cylinder block.

The demand for mass production in many lines has led to the development of many special machines adapted to perform several different operations at one setting, thus greatly reducing labor costs and handling time. Because of their high initial cost, some of these machines are economical only for large-scale production where the volume of production before the machine becomes obsolete can be predicted with fair accuracy. *See* OBSOLESCENCE.

Modern machine shop practice involves not only

the selection and operation of machines but also the economics of their operation as well as the problems of instructing and managing men to operate them. Shop construction, sanitation and comfort of employees, wage incentives or other means of stimulating production (*see* WAGE SYSTEMS IN INDUSTRY), hours of labor and unemployment are now part of the great problem of managing plants for the manufacture of machine-shop products.

New steels and other metals make possible stronger and lighter products. New cutting alloys have changed machining practice in many ways. Metals that could not be used economically because of tool failures, are modernly available. Cutting speeds have increased with a corresponding increase of output. Machine tools must be made stronger and faster to utilize the new cutting alloys. The manager of a machine shop is confronted with problems of buying new machinery and of using cutting alloys that sell for several hundred dollars a pound during their development stages. Will the increased output or quality warrant the expenditure of the amounts necessary? Will his competitor utilize the newest equipment and methods?

Modern machine shop practice is constantly developing new methods to meet new requirements and to handle old operations. Some of these, e.g., HONING, have made older types of machine equipment obsolete almost over night. Modern accuracy requirements have necessitated the devising and building of new instruments for measuring and inspecting the parts that go to make up the completed machine. Where a few years ago a thousandth of an inch was considered as the practical limit of accuracy, we now measure in ten-thousandths of an inch and indicate in hundred-thousandths. Operators have become accustomed to work in tenths of a thousandth; nearly all mechanisms are now built with great accuracy.

Perhaps a definition of modern machine shop practice may be stated as being the art of selecting the proper equipment by which the product is to be made, considering always the accuracy, the quantity to be made and, lastly but very important, the selling price. The economical operation of this equipment is just as necessary as its selection and this involves the training of operatives, the purchase and following up of materials, securing maximum production while maintaining the good will and cooperation of the men, and many other problems which were unknown to the shop manager of fifty years ago. *See also* SCIENTIFIC MANAGEMENT; MACHINING; PRODUCTION, INTERCHANGEABLE. F. H. C.

MACHINE TOOLS. There is no standard definition of this term but it is generally applied to that class of metal cutting machinery with which other machines can be built, such as LATHES, DRILLING MACHINES or drill presses, boring machines, PLANERS, SHAPERS, MILLING MACHINES, GEAR CUTTING MACHINES, GRINDING MACHINES, BROACHING MACHINES and many modifications of each of these. Machines of this type can build all other machines and can also reproduce themselves.

Lathes include plain machines for turning and boring, turret lathes that carry numerous tools for performing different operations at one set-up, and automatic and semi-automatic lathes with the tool movements automatically controlled by cams, screws, gears and levers. Drilling machines are perhaps most numerous of all and vary from small machines that drill holes a few thousandths of an inch in diameter at 10,000 to 20,000 revolutions per minute, to huge machines that carry a 4-in. drill or a larger boring tool. They are made with a single spindle or may drill over a hundred holes simultaneously; they may drill on one surface or on two, three or even five sides of a piece at the same time.

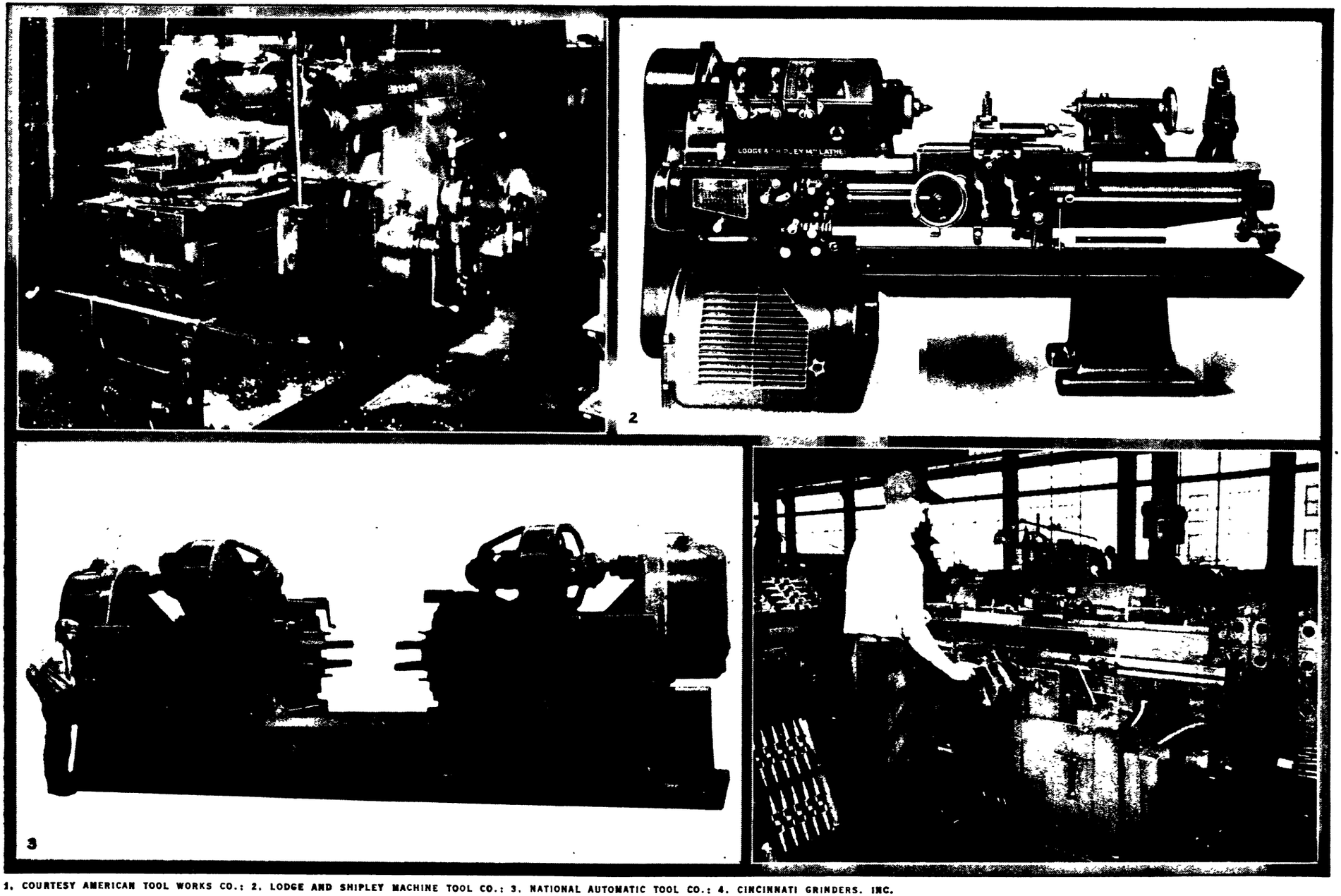
Planers produce flat surfaces by moving the work past stationary tools. They are made with both single and double housings, the former being called "open side" planers. Shapers also produce flat surfaces but the work remains stationary, a ram moving a tool across it in a straight line. A similar machine with the ram vertical, is called a SLOTTING MACHINE.

Milling machines use rotary cutting tools, the work traveling past the cutters either in a straight or circular path. With cutters made in various contours, flat, curved and angular surfaces can be milled at one "pass" of the cutters. The milling machine has taken over much of the type of work formerly done by the planer. The rotary form of gear cutting machine is a natural development of the milling machine, using a cutter having the desired tooth form. In the gear HOBBING MACHINE, a further development of the miller, the cutting tool resembles a "tap," or fluted screw, and both cutter and work revolve at proper speeds with relation to each other to produce the teeth in the gear wheel, at the same time feeding across the face of the gear blank. Gears are also cut by special planing and shaping machines.

Boring machines are of two types, vertical and horizontal. Vertical machines are called boring mills and revolve the work past stationary cutting tools. In horizontal boring machines the work is stationary and the tools revolve.

Grinding machines are of wide variety, from the plain stand with a coarse wheel for "snagging" castings in a foundry to the highly developed center or centerless grinders that produce work accurate within .0001 or .0002 inch. Machines for grinding flat surfaces and for internal grinding have also been brought to extreme accuracy, some having hydraulic instead of mechanical feeds. The HONING machine is another development of the grinder in which the hone or grinding head fits the hole being finished instead of using a grinding wheel in the usual manner. LAPPING machines are a special form of grinder for securing the highest grade of accuracy and finish, usually on cylindrical surfaces, as, e.g., piston pins for automobiles.

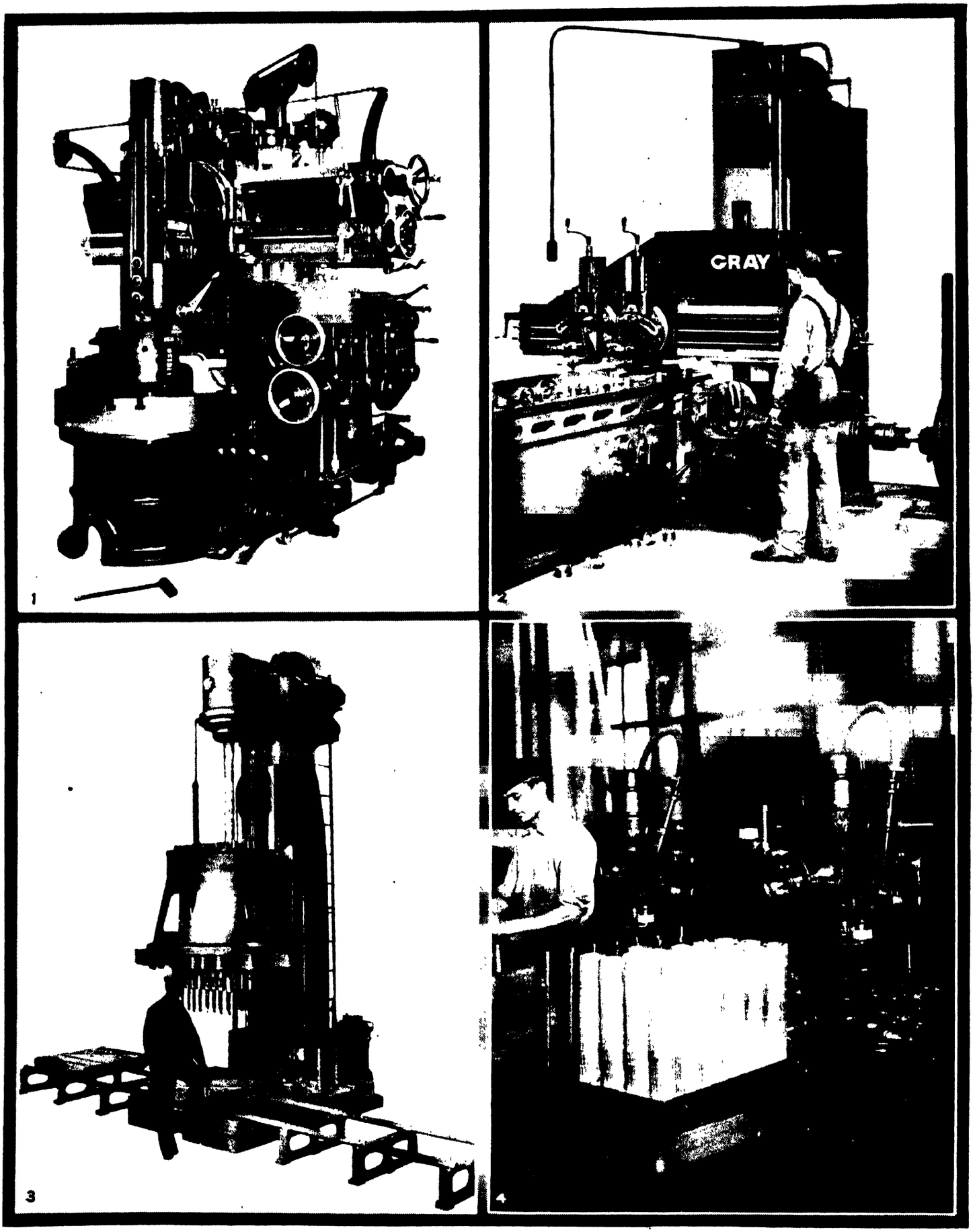
Broaching is a rapid and accurate process of finishing by forcing a series of cutting edges past the surface to be cut. Each tooth cuts a very light chip. While generally used for finishing irregular



1, COURTESY AMERICAN TOOL WORKS CO.: 2, LODGE AND SHIPLEY MACHINE TOOL CO.: 3, NATIONAL AUTOMATIC TOOL CO.: 4, CINCINNATI GRINDERS, INC.

I. TYPES OF MACHINE TOOLS

1. Shaper machining a railroad locomotive driving box. **2.** Engine lathe.
3. Two-way horizontal 40-spindle driller used for drilling rivet holes in H beams. **4.** Grinder in use finishing bearings on crankshafts.



1, COURTESY KING MACHINE TOOL CO.; 2, G. A. GRAY CO.; 3, NATIONAL AUTOMATIC TOOL CO.; 4, FELLOW GEAR SHAPER CO.

II. TYPES OF MACHINE TOOLS

1. Boring mill for boring and facing locomotive driving boxes. **2.** Openside planer in operation planing a steel slab. **3.** Sixteen-spindle vertical drill. **4.** Two high-speed gear shapers in operation cutting automobile gears.

shaped holes, it is also used in round holes and, to some extent, for finishing outside surfaces. F. H. C.

MACHINING, the cutting of metals into the shape desired for use in the product being built. The term might well be made to cover the forming of metal without cutting, as in some of the presswork operations where a sheet of metal is formed into a variety of shapes.

Machining may be said to include the holding of the metal in the machine and the cutting of it by tools of any kind, such as turning in the LATHE, surfacing in the PLANER or SHAPER, or the operations performed in drilling, milling, grinding, broaching and by other methods. *See* MACHINE TOOLS. Two highly desirable features of machine tools are a high cutting speed and a high rate of feed, or the size of chip which can be taken at each cut. Both depend largely on the material to be cut and the tool used.

Before the days of modern high speed steels the old carbon steel tools were limited to comparatively low speeds, 30 feet per minute being about all that could be counted on when machining cast iron or soft steel. "High speed" steel cutters doubled this, and during the past few years new cutting alloys such as *stellite, carboloy, firthite, widia* and others have, in many cases, increased the possible cutting speed many times. This increased speed is made possible by the fact that unlike the carbon tools, the hardness of the newer cutting alloys is not affected by the heat generated in machining.

With the coming of high speed cutting tools, the machines in which they were used were redesigned and built to have sufficient power and rigidity for the increased speeds. Improvements in holding the work were also developed and methods of machining underwent many changes. Planing in some cases has given way to milling and in others Grinding Machines have taken work away from both the Milling Machine and the lathe. Honing has replaced certain types of grinding. Broaching does work that was formerly drilled, reamed, filed and milled. In some instances swaging is used instead of turning while presses (*see* PRESSES AND PRESSWORK) now bend, form and draw sheet metal into intricate shapes that were considered impossible only a few years ago.

The increase in cutting speeds has introduced a new and serious problem, that of removing the chips produced by the machine. The chips of some metals come off in long curls which roll out hot at the rate of 100 to 200 feet per minute, constituting a menace both to machine and worker. Chip breakers can sometimes be used to advantage but they take considerable power and are not always satisfactory. Where chips break easily as in most cast metals, they can be readily removed by installing a conveyor under a grating in the floor, but where chips have to be handled by man power, it is frequently difficult to prevent them clogging both the machine and the floor space around the machine. Machining involves more difficulties than ever before, and requires an ever higher type of man as executive. F. H. C.

MACINTOSH, CHARLES (1766-1843), British scientist and inventor, born at Glasgow, Dec. 29, 1766. He improved cloth making machinery, discovered the preparation of steel by the absorption by hot iron of carbon from carbon-bearing gases, and invented waterproof clothing by cementing rubber sheeting to fabrics. He died at Dunchattan, Scotland, July 25, 1843.

MACKAY, CLARENCE HUNGERFORD (1874-), American capitalist, was born at San Francisco, Cal., on Apr. 17, 1874. After being educated at private schools in Europe, he entered his father's office in New York City at 20 years of age. In 1902 he succeeded his father as president of the Commercial Cable Co. of Cuba, the Postal Telegraph Cable Co. and other allied Mackay companies. He was one of the founders of the New Theater in New York, and served as a director of the Metropolitan Opera and a trustee of the Metropolitan Museum. In 1931 he married Anna Case, American opera star.

MACKAY, JOHN WILLIAM (1831-1902), American capitalist, was born at Dublin, Ireland, Nov. 28, 1831. He came to the United States in 1840, going to California as a miner in 1851. After many failures, Mackay with others discovered the famous Bonanza vein 1,200 feet deep in the Comstock Lode. As a partner of James Gordon Bennett in 1884, he helped to organize the Commercial Cable Company and, later, the Postal Telegraph Company. Despite great obstacles, he succeeded in laying two transatlantic cables. His unfriendly relations with Jay Gould and the Western Union Telegraph Co. led to a bitter rate-war, in which Mackay finally triumphed. He died at London, July 20, 1902.

MACKAYE, JAMES STEELE (1842-94), American actor, playwright and manager, was born at Buffalo, N.Y., June 6, 1842. He fought in the Civil War attaining the rank of major. His best-known plays were *Hazel Kirke,* 1880, and *Paul Kauvar,* 1887. In 1884 he founded the Lyceum Theatre, New York City. It embodied many of his inventions and innovations in stage and auditorium. As playwright, teacher, pioneer and inventor, his work had an important influence on the American stage. He died at Timpas, Col., Oct. 24, 1894.

MACKAYE, PERCY (1875-), American dramatist and poet, was born in New York City, Mar. 16, 1875, the son of JAMES STEELE MACKAYE. He was educated at Harvard University and in Leipzig, Germany. His first play, *Jeanne d'Arc,* was presented in Philadelphia, Oct. 15, 1906. Perhaps the best liked of his many successive plays are *The Canterbury Pilgrims, The Scarecrow, Kinfolk of Robin Hood* and *This Fine Pretty World.* He is the author of the libretti of the operas, *The Immigrants, Sinbad the Sailor,* and *Rip Van Winkle.* In 1927 he published *Epoch, the Life of Steele Mackaye.* He has written many essays on the drama and done much to forward the movement for folk plays and community theaters in America.

MACKENSEN, AUGUST VON (1849-), German field marshal, was born Dec. 6, 1849, at

Hausleipnitz, Saxony. He rendered conspicuous service to the Central Powers in the World War. Commanding at first the 9th Army, he broke through the Russian front in Galicia (1914). In the early part of 1915, he commanded the 11th Army in Western Galicia, being made field marshal in June of that year. He later took Brest-Litovsk and Pinsk. In the fall of 1916 he overran Serbia and was commander-in-chief of the combined troops of the Central Powers which crushed Rumania and forced its surrender in Jan. 1917. Mackensen was made military governor of Rumania. At the end of the war Mackensen was taken prisoner by the Allies and held at Saloniki till Nov. 1919. He retired from active service the following year.

MACKENZIE, SIR ALEXANDER (1755-1820), British explorer, was born at Inverness, Scotland. Going to Canada in 1779 he became a member of the Northwest Company, stationed at Fort Chippewyan. From this base in 1789 he discovered the Mackenzie River, following it to the Arctic Ocean. In 1793 he led an expedition westward over the Rocky Mountains to the Pacific Ocean. His explorations in the west were later the basis of the unsuccessful claim of Great Britain to the Oregon Territory. Mackenzie returned to Scotland, was knighted and is the author of *Voyages from Montreal to the Frozen and Pacific Oceans.* He died near Dunkeld, May 11, 1820.

MACKENZIE, ALEXANDER (1822-92), first Liberal premier of the Dominion of Canada, was born in Perthshire, Scotland. He emigrated to Canada in 1842, working as stone-mason and later as a building contractor. In 1852, his interest in reform taking precedence, he assumed the editorship of the liberal *Lambton Shield.* In 1861 he became a member of the Union Parliament, and entered into close association with George Brown. Mackenzie served in the first Dominion parliament, and became the leader of the opposition; it was a vote of censure moved by him that ousted the MacDonald Conservatives from the administration. In the Liberal government established in January 1874, Mackenzie became premier and assumed the portfolio of public works. His endeavors to administer that department efficiently engrossed his time; he neglected to maintain the necessary contacts with party members or to keep informed of the development of public opinion, and the government, in which the presence of the able Edward Blake caused divided leadership, developed fatal weaknesses. The party, resting on its genuine legislative achievements, in the elections of 1878 was overthrown by the popular appeal of "National Policy." In 1880 ill health compelled Mackenzie to resign the Liberal leadership, but he remained in parliament until his death Apr. 17, 1892.

MACKENZIE, ARTHUR STANLEY (1865-), Canadian educator, was born in Pictou, N.S., Sept. 20, 1865. He was educated at Dalhousie University, Halifax, and Johns Hopkins. After teaching mathematics at Dalhousie for two years he served in the department of physics at Bryn Mawr from 1891-1905. In 1905 he returned to Dalhousie as Munro professor of physics, and six years later became president. He is the author of numerous scientific papers and in 1900 edited a collection of memoirs on *The Laws of Gravitation.*

MACKENZIE, COMPTON (1883-), English novelist and playwright, was born at West Hartlepool, Jan. 17, 1883. He was educated at Magdalen College, Oxford, and helped to establish *The Oxford Point of View,* editing it in 1902-04. Of his plays, *Gentleman in Grey* appeared in 1906, and *Carnival,* presented in 1912, was also successful as a novel. Mackenzie served in the World War, and his *Gallipoli Memories* was published in 1929. Among his other books are *Poems,* 1907, *The Passionate Elopement, Sinister Street,* 1913-14, *Sylvia Scarlett,* 1918, *Poor Relations,* 1919, *Extraordinary Women,* 1928, and *Athenian Memories,* 1931.

MACKENZIE, HENRY (1745-1831), Scottish writer, was born at Edinburgh, Aug. 25, 1745, and educated at the University of Edinburgh. He studied law and became an attorney for the crown. In 1771 he published anonymously *The Man of Feeling,* which quickly brought him fame. He edited *The Mirror* and *The Lounger,* and was among the first to acclaim the works of Robert Burns and Sir Walter Scott. Mackenzie's writings include *Man of the World, Julia de Roubigne* and *Anecdotes and Egotisms of Henry Mackenzie.* He died at Edinburgh, Jan. 14, 1831.

MACKENZIE, SIR JAMES (1853-1925), Scottish physician of Scone, Perthshire. He graduated in medicine from the University of Edinburgh in 1878, and after practicing at Burnley for nearly thirty years, went to London, where he attained considerable fame through his scientific methods and the publication of books on pulse, heart disease, and angina pectoris. He was the first physician to make simultaneous records of the arterial and venous pulses to illustrate the clinical condition of the heart. His investigations were instrumental in calling attention to the energy of the heart muscle. He also demonstrated the efficacy of digitalis in auricular fibrillation. He retired from practice in 1918 and established an Institute for Clinical Research at St. Andrews, 1919. Mackenzie died on January 26, 1925. M. F.

MACKENZIE, SIR WILLIAM (1849-1923), Canadian engineer and capitalist, was born at Kirkfield, Ontario, Oct. 30, 1849. He became a teacher, but gave it up to build part of the Victoria Railway (now incorporated in the "Grand Trunk") and built part of the mountain-division of the Canadian Pacific Railway. In 1886 he formed a partnership with Sir Donald Mann, and during the next thirty years laid more than 5,000 miles of tracks, including those of the Canadian Railway, of which he became president. Mackenzie was also interested in the street railways of Toronto, Montreal, and Winnipeg. He died at Toronto, Dec. 5, 1923.

MACKENZIE, WILLIAM LYON (1795-1861), Canadian political leader, prominent in opposition to

the "Family Compact" and as organizer of the Rebellion of 1837 in Upper Canada. He was born near Dundee, Scotland, and in 1820 emigrated with his mother to Canada, with intent to continue in his profession of merchant; discontent in Upper Canada attracted him to politics, and in 1824 he founded the *Colonial Advocate* at Queenston. As editor of the leading propagandist sheet for reform, he incurred the displeasure of the ruling oligarchy. Supporters of his opponents wrecked his newspaper office in 1826; the damages which he sued for and received enabled him to continue the paper on a more pretentious scale until Nov. 1834. Mackenzie was five times elected, expelled and reelected to parliament from York during 1828-32.

Disheartened by the apparently conclusive Tory success in the elections of 1836, Mackenzie began the publication of the *Constitution,* openly advocating republican government. He entered into correspondence with PAPINEAU in Lower Canada; the two planned the uprising of 1837. The failure of that movement drove him to the United States, where in 1839-40 he served a sentence in prison at Rochester for breach of the neutrality laws. After the amnesty, in 1849, he returned to Canada, and in 1851 was elected to parliament for Haldimand. In 1858, mentally ill, he resigned his seat. His last political activities were in opposition to the movement for annexation of Canada to the United States. He died at Toronto, Canada, Aug. 28, 1861.

MACKENZIE RIVER, a large river of northwestern Canada, flowing northward to the Arctic Ocean. It is the gathering stream of the Mackenzie River system which, with its main branches, the Athabasca, Peace, Slave and Liard rivers, drains some 677,000 sq. mi., including portions of Saskatchewan, Alberta, British Columbia, Northwest Territories and the Yukon. Its most remote source is at 52° 20′ N. lat. and its mouth at 69° N. lat., a difference of almost 16 degrees. While the system as a whole measures 2,525 mi., the Mackenzie proper issues from Great Slave Lake and flows over 1,000 mi. to the sea where it discharges through a delta. Its width varies from ½ mi. to 4 mi. and its depth is nowhere less than 7 or 8 ft. The fall from Great Slave Lake to the mouth is 391 ft. Like all north-flowing rivers in high latitudes, the upper portion of the Mackenzie thaws in the spring before its lower reaches are open and the flood waters spread over the lower valley, leaving marshes and shallow lakes when they recede. Its valley is a shallow depression bounded on the west by the Rocky Mountains and on the east by broad plains. Forests of spruce border the upper reaches but gradually give way to the open tundras of the Arctic regions.

To the Indians and a few white people living in the Mackenzie valley the river has great importance since it is the chief highway of trade and travel. During the summer months it affords continuous navigation for steamers from its mouth to Fort Smith on the Slave River, a distance of 1,120 mi. Fur trading is the chief industry of the region. The only settlements are Catholic and Anglican missions and Hudson Bay trading posts, many of which have existed over 100 years. The river was named for Sir Alexander Mackenzie, a member of the Northwest Company, who explored it in 1789.

MACKENZIE TERRITORY, a district in Canada, now merged in the Northwest Territories. It comprises an area of 541,800 sq. mi. The chief lakes are the Great Bear and the Great Slave. The rivers include the Mackenzie and the Coppermine. The climate is arctic. Fur-trading is the principal occupation of the inhabitants, which number about 5,000. The territory was named in honor of Sir Alexander Mackenzie (1755-1820), the first white man to reach, in 1793, the Pacific overland from Canada.

MACKEREL, the common name for a numerous family (*Scombridae*) of food and game fishes. They are fast-swimming oceanic species, sometimes of great size, and may be distinguished from other mackerel-like relatives by their smooth scales, metallic coloration and especially by the series of separate finlets behind the dorsal and anal fins. Besides the common mackerel, the family includes the Spanish mackerel, TUNNY or tuna, albacore, BONITO and other important fishes.

The common mackerel (*Scomber scombrus*), a valuable food fish of the North Atlantic, ranges from southern Labrador to Cape Hatteras and from Norway to Spain. It is a handsome fish with a very smooth, spindle-shaped body, small scales and a slender tail terminating in a deeply forked fin. In color it is greenish or bluish above, marked with about 35 dark transverse bands, and silvery below. Mature fish average from 12 to 18 in. in length and from 1 to 3 lbs. in weight. The young, according to their sizes, are known as spikes, blinkers or tinkers. The common mackerel is a strong, rapid swimmer, moving in vast schools and preying voraciously on small fishes and crustaceans. It appears near the coasts in spring and returns in autumn to deeper water, fluctuating exceedingly in abundance from year to year. This species is one of the most highly esteemed of food fishes, excellent in flavor when fresh or when preserved by salting or pickling, and supports important fisheries both in Europe and America. In 1929 the catch in United States waters was 64,119,000 lbs., valued at $2,398,000; the Canadian catch was 152,756 cwt., valued at $363,926.

MACKEREL, SPANISH, an excellent food fish (*Scomberomorus maculatus*) closely allied to the common mackerel, found on the Atlantic coast from Cape Ann to Brazil. It has a slender graceful body, bluish above and silvery below, spotted with dull orange on the sides, and averages somewhat less than 3 lbs. in weight. Moving in large schools, it feeds voraciously on smaller fishes. Spanish mackerel is caught in large quantities from Cape May southward. In 1929 the total catch in United States waters was 6,314,000 lbs., valued at $405,000.

MACKINAC ISLAND PARK, a state park located on the island of Mackinac, Mich., at the entrance to the Straits of Mackinac, in the northwestern extremity of Lake Huron. Round Island, a surplus lighthouse property, was added in 1927, making the total area 1,983 acres. This park and Machilimackinac State Park at Mackinaw City were the first state parks to be established, the land having been transferred by the Federal government to the State of Michigan in 1885. Mackinac Island is rich in Indian lore and figured prominently in early frontier life. An extensive system of trails and drives penetrates the deep forests of the interior of the island and follows the limestone cliffs on the shore line.

MACK'S CEMENT. *See* GYPSUM PLASTER.

MACLEAN, JAMES ALEXANDER (1868-), Canadian educator, was born in Mayfair, Ont., Aug. 2, 1868. He graduated from the University of Toronto in 1892 and took his Ph.D. at Columbia in 1894. From 1894-1900 MacLean was professor of political science at the University of Colorado, and from 1900-13, president of the University of Idaho. In 1913 he was made president of the University of Manitoba. He is the author of a number of essays on Canadian financial history.

MACLEOD, JOHN JAMES RICKARD (1876-), British physiologist and biochemist, born at Cluny, Scotland, Sept. 8, 1876. From 1899 to 1902 he was demonstrator in physiology at the London Hospital. In 1903 he became professor of physiology at Western Reserve University, Cleveland, Ohio, where he remained until he became director of the physiological laboratory at Toronto University in 1918. It was under his direction that insulin was discovered, and he shared with Banting the Nobel Prize in medicine in 1923 for his work in the discovery. His writings include *Fundamentals of Physiology,* 1919, and *Physiology and Biochemistry in Modern Medicine.*

MACMAHON, MARIE EDMÉ PATRICK MAURICE DE, DUKE OF MAGENTA (1808-93), French marshal and president, of Irish descent, was born July 13, 1808, at Autun. He was educated at Saint Cyr and first distinguished himself in Algeria. Later he served in the Crimea, being present at the fall of Sevastopol (1855), at Magenta (1859), at Sedan (1870), where he was severely wounded, and at Wiesbaden where he was interned. Elected to the presidency by the monarchical assembly in 1873, under pressure from the Republicans (1873), he resigned in 1879, and retired from public life. Although an able general, he lacked genuine statesmanship. He died in Paris, Oct. 17, 1893.

MACMILLAN, KERR DUNCAN (1871-), American educator, was born in Mt. Forest, Ont., Mar. 17, 1871. He was educated at the universities of Toronto and Berlin. In 1897 MacMillan joined the faculty of Princeton Theological Seminary where he was instructor in Old Testament until 1900; instructor in Semitic languages, 1903-07, and instructor in church history, 1907-13. In the latter year he became president of Wells College.

MACMONNIES, FREDERICK (1863-), American sculptor, was born in Brooklyn, N.Y., Sept. 28, 1863. He studied with AUGUSTUS SAINT-GAUDENS and under JEAN FALGUIÈRE in Paris. His statue of *Diana* received honorable mention at the Salon of 1889, and a *Bacchante,* 1894, was purchased by the Luxembourg Museum. His best known works are the statue of Nathan Hale, New York; Sir Harry Vane, Boston; the doors of the Congressional Library, Washington; the soldier and sailor groups in the Prospect Park Triumphal Arch, Brooklyn, and the Battle Monument, West Point.

MACNEIL, HERMON ATKINS (1866-), American sculptor, was born at Chelsea, Mass., Feb. 27, 1866. He studied in Paris under Henri Chapu and JEAN FALGUIÈRE, and spent four years in Rome. MacNeil taught art at Cornell University and in the Art Institute, Chicago. He has specialized to some extent on Indian subjects, and his important works in this field include *The Mogui Runner, A Primitive Chant* and *The Sun Vow.* His decorative work at the Chicago, Paris, Buffalo, St. Louis and Panama expositions was outstanding. Other works include the McKinley Memorial at Columbus, O.; Soldiers and Sailors memorials at Whitinsville, Mass., and Albany, N.Y.; the Orville Hitchcock Platt Memorial in the State Capitol at Hartford; the statue of Gen. Washington at the Washington Arch, New York; a frieze in the Missouri State Capitol; groups at Northwestern University; the Ezra Cornell Memorial at Cornell University; the Flushing, L.I., War Memorial; the Marquette Memorial, Chicago; *The Pilgrim Fathers,* at Waterbury, Conn.; and busts of Choate and Parkman in the Hall of Fame.

MACOMB, a city in McDonough Co., western Illinois, situated 59 mi. northeast of Quincy. Two railroads afford transportation. The city is surrounded by a grain- and stock-raising region. It has many manufactures, including porcelains, drain pipes and machine shop products. Macomb is the seat of Western Illinois State Teachers College. The city was founded in 1830 and incorporated in 1857. Pop. 1920, 6,714; 1930, 8,509.

MACON, NATHANIEL (1758-1837), American soldier and statesman, was born at Macon Manor, N.C., on Dec. 17, 1758, of Huguenot extraction. He attended the College of New Jersey (Princeton), but left before his graduation to enlist as a volunteer in the Continental army. In 1781-85 he served in the North Carolina Senate. There he opposed the federal Constitution, but, upon its ratification, became a member of the House of Representatives. He served in the House from 1791 to 1815, being Speaker from 1801 to 1807, and in the Senate from 1815 to 1828, being President *pro tempore* in 1826-27. During his extended Congressional service he opposed Hamilton's financial policies, gave President Jefferson his hearty support, voted for war against Great Britain (1812), consistently criticized federal internal improvement schemes, and opposed the Missouri Compromise. He died at Buck Springs, N.C., on June 29, 1837.

MACON, a city and the county seat of Bibb Co. situated near the center of Georgia on the Ocmulgee River. Bus, truck and airplane lines and five railroads serve the city. Cotton, peaches and truck crops grow in the vicinity. The chief manufactures are textiles, fertilizers, ceramics and lumber products. In 1929 the factory output reached approximately $29,000,000; the retail trade amounted to $26,396,701. The city was founded in 1823 by settlers from North Carolina. At a much earlier date the Spanish explorers visited here. There are several interesting Indian mounds nearby. Wesleyan College for women, founded in 1836, the first college in the world to confer degrees on women, is located in Macon and also Mercer University, Georgia Academy for the Blind and other institutions of learning. Sidney Lanier, the poet, was born in Macon. Pop. 1920, 52,995; 1930, 53,829.

MACPHERSON, JAMES (1736-96), Scottish poet, was born at Ruthven, Scotland, Oct. 27, 1736. He became interested in Gaelic poetry, and in 1761 published *Fingal, an ancient epic poem,* which he asserted to be a translation of ancient Gaelic poems by "Ossian, son of Fingal." (*See* OSSIAN.) The authenticity of the original was immediately questioned. Violent controversies ensued in which Dr. Johnson joined, characterizing Macpherson as a cheat and a ruffian. No original manuscripts were ever produced by the poet. Whether *Fingal* was a translation or Macpherson's own invention, it nevertheless had a great influence on the rise of the romantic movement in poetry. (*See also* ROMANTICISM.) Macpherson died at Belville, his estate in Inverness, Feb. 17, 1796.

MACPHERSON, SIR WILLIAM GRANT (1858-1927), British army physician and writer, was born at Kilmuir, Scotland, on Jan. 27, 1858. He attended Fettes College and later studied extensively at the universities of Edinburgh, Tübingen, and Leipzig. After acting in various capacities as a military medical officer or adviser in Morocco, South Africa, Cuba, Panama, Malta and Japan, he served in 1911-14 as assistant director of medical services in the Staff College at Quetta, India. During the World War he conspicuously aided in increasing the efficiency of medical service in the British armies, and later edited the *Official Medical History of the War.* He died in London on Oct. 15, 1927.

MACREADY, WILLIAM CHARLES (1793-1873), English actor, was born at London, Mar. 3, 1793. As Romeo, June 7, 1810, at Birmingham, he made his first stage appearance. He first appeared in London at Covent Garden Theatre, Sept. 16, 1816, as Orestes in Racine's *Andromaque.* He managed Covent Garden, 1837-39, Drury Lane Theatre, 1841-43, and made successful visits to America in 1826, 1843 and 1849. The last visit culminated in the Astor Place riots in New York City, caused by a petty quarrel between him and EDWIN BOOTH.

His chief plays were *Richard III, William Tell, Werner, Antony and Cleopatra, Rob Roy, Virginius, King Lear, Richelieu* and *Henry V.* In his *Reminiscences,* 1875, Macready recorded his associations with Browning and Bulwer-Lytton, both of whom he encouraged as playwrights. He retired from the stage in 1851, and died in Cheltenham, Apr. 27, 1873.

MACROBIUS, AMBROSIUS AURELIUS THEODOSIUS (5th century), Roman grammarian, lived early in the 5th century. Little is known of his life, although he was thought to be Greek by birth. Among his extant works is a commentary on Cicero's *Dream of Scipio* as given in the *De Republica.* Portions of his *Saturnalia* remain. This was a large assortment of the discussions at the *Saturnalia;* the 1st book deals with the Roman calendar, the 7th with physiological matters, and four books are about Vergil. It is thought that Macrobius died about 425.

MACVEAGH, WAYNE (1833-1917), American lawyer and diplomat, was born near Phoenixville, Pa., Apr. 19, 1833. He graduated from Yale in 1853, was admitted to the bar in 1856, began practice at West Chester, Pa., and he was District Attorney of Chester Co., Pa., 1859-64. When the Civil War broke out MacVeagh entered the Union Army as a major but he never saw active service because of poor health. He was Minister to Turkey 1870-71, a member of the Pennsylvania Constitutional Convention, 1872-73, and in 1877 chairman of the MacVeagh Commission, sent by President Hayes to settle the dispute between the two state governments of Louisiana. In 1881 he became United States Attorney General under Garfield, which office he resigned upon the accession of Arthur to the Presidency. He supported Cleveland in 1892, and during his administration he was Ambassador to Italy, 1893-97. Upon his return to the United States he re-assumed his Republican affiliations. MacVeagh was chief counsel for the United States in the Venezuela arbitration proceedings of 1903. He died in Washington, Jan. 11, 1917.

MADAGASCAR, the third largest island in the world, situated in the Indian Ocean. It is separated from the east coast of Africa by the Mozambique Channel, with a minimum width of 240 mi., and lies between 12° and 25° S. lat. The island, a French colony, is 980 mi. long, has a maximum width of 360 mi. and an area of 228,000 sq. mi. The population, including some small adjacent islands, is 3,743,642 of which 20,000 are Europeans, mostly French, and there are pockets of Arabs, Indians and Chinese. The natives, *Malagasy,* are mainly of Malayo-Polynesian stock derived from early invasions, but there has been intermarriage with African Negroes. Substantially the same language, *Hova,* exists throughout the island.

A plateau rises to an altitude between 3,000 and 4,000 ft. from a coastal plain. Ankaratra, 8,270 ft., is a volcanic area. The rivers draining to the Mozambique Channel have some value for navigation, especially in summer. The climate is very hot on the coast, but temperate on the elevated interior. The highlands are grasslands; the plains and slopes on the east are mainly tropical forests. Ebony, rosewood, bamboo, rubber, copal and raffia palm are found, but

the forests have been seriously reduced by native methods of cultivation. Rare forms of animal life, including lemurs and chameleons, are common. The carnivores of the mainland are absent.

Rice and maize are widely grown. Beans and potatoes are exported to Reunion and Mauritius. Cotton, coffee, tobacco and sugar are grown for local use. On the plateau stock-raising is a staple occupation, and hides are exported. Mineral wealth is of considerable importance. Gold, coal, bauxite and graphite are mined, and iron, copper, nickel and lead ores are known to exist.

Antananarivo is the *Hova* capital, Tamatave the leading port. The colony is administered by a governor aided by a council. The protectorate of France over Madagascar was recognized in 1890. Six years later rebellion led to the island becoming a French colony.

MADAME BOVARY, a realistic novel of French provincial life, by GUSTAVE FLAUBERT; published 1857. This is the minutely detailed story of a weak and sentimental woman, Emma Bovary, the wife of a good-hearted provincial doctor. Finding life with her husband intolerably dull, she becomes the mistress first of Rudolph Boulanger, then of Léon Dupuis, ruins her husband by her extravagance, and at last, in despair, kills herself by taking poison, her husband dying soon after when he discovers the full extent of her infidelity. With its cool, dispassionate exactitude in every word and phrase, *Madame Bovary* is perhaps the greatest of all realistic novels.

MADAME BUTTERFLY, an opera in two acts by GIACOMO PUCCINI, libretto based on a story of John Arthur Long by Giacosa and Illica; première, Milan, 1904, London, 1905, New York, 1906. Although the opera was hissed at its première at Milan, it gradually gained popularity, and is now included in the standard repertory.

Madame Butterfly, otherwise Cio-Cio-San, is a pretty Japanese girl of Nagasaki. Falling in love with Lieutenant Pinkerton of the United States Navy, she marries him. Soon after the wedding her American husband returns to his own country, assuring his bride of his devotion. In the course of time a golden-haired boy is born. She waits patiently for her American husband, but after three years she is advised by Sharpless, the American consul, to marry the rich Yomadori, who loves her. Pinkerton, Sharpless intimates, is soon to arrive again in Japan, but he meanwhile has married an American girl, Kate. Butterfly, in ecstasy, hardly hears him. She only knows that her husband again will soon be with her. She refuses to marry the rich Yomadori, and decorates her little home with cherry blossoms. Eventually Kate arrives. Pinkerton himself is absent, and Madame Butterfly suddenly understands the situation. Kate asks to be allowed to have the boy, and the jilted bride says she may—in half an hour. Going into the house, she places an American flag in her son's hand, blindfolds him, and then stabs herself with her father's dagger.

MADDER (*Rubia tinctorum*), a climbing perennial herb of the madder family (*Rubiaceae*), long cultivated as a dye plant. It is a native of southern Europe and Asia where it was formerly extensively grown for its roots which furnished the most important red dye. Since the production, beginning in 1869, of alizarin, its chief coloring principle, by chemical means, cultivation of madder has rapidly diminished.

MADDOX, WILLIAM ARTHUR (1883-), American educator, was born in Richmond, Va., Feb. 24, 1883. He graduated from William and Mary College in 1904 and took his Ph.D. at Columbia University in 1917. From 1910-16 he was successively connected with the State Normal College, Farmville, Va., and the State Normal School, Oswego, N.Y.; and from 1916-19 was assistant professor of education at Teachers College of Columbia University. In 1919 Maddox was elected president of Rockford College.

MADEIRA ISLANDS, a Portuguese archipelago in the Atlantic Ocean, lying about 400 mi. from the coast of Africa. Only two of the islands are inhabited, Madeira and Porto Santo. The others, two groups known as the Desertas and the Selvagens, are uninhabited. Their total area is 314 sq. mi.

Madeira itself is 35 mi. long and 12 mi. wide and consists of a mass of volcanic rocks. The peaks rise to about 6,000 ft. above the water and are covered with luxuriant verdure. The foothills and valleys are thick with groves of lemon and orange trees. Higher up, various other fruits, including bananas, figs, pomegranates, apples, pears and peaches are raised. The island is particularly famous for its vineyards and the superior quality of its wine. Wheat, rye and corn are cultivated. Funchal, on the southern coast, is the largest town and the capital of the Madeiras, which form a district of the Portuguese state.

The island of Porto Santo lies 25 mi. northeast of Madeira and is six mi. long and three wide. The Desertas, three small isles, the largest of which is Deserta Grande, are approximately 10 mi. southeast of Madeira. The Selvagens, also three islets, are 150 mi. from Madeira. Great Piton, three mi. long and one wide, is the largest of the trio. Pop. 1930, 210,220.

History. Although officially discovered by the Portuguese in 1420 Madeira appears upon an authentic map of the 14th century and had probably been visited by private traders long before its public discovery. In 1418 João Zarco discovered Porto Santo and two years later found the main island. He annexed this to Portugal with which it has since been incorporated, not as a colony but an integral part of the nation, except for two brief periods, 1801 and from 1807-14 when it was occupied by Great Britain.

MADEIRA VINE (*Boussingaultia baselloides*), a perennial herbaceous vine of the basella family, widely grown as a cover for arbors and porches. It is native to tropical America, and has run wild in Florida and Texas. The rapidly growing stem, attaining a height of 10 to 20 ft., bears oblong somewhat heart-shaped leaves and slender clusters, sometimes a foot long, of small fragrant white flowers.

MADELEINE, CHURCH OF THE, a church of great size, in Paris. It was begun in 1764 during the reign of Louis XV with Coutant D'Ivry and Couture as architects; continued under Napoleon I according to its present design by Vignon; and completed by Huve in 1832. The exterior is that of a Roman Corinthian temple, octo-style, surrounded by columns and the richly decorated interior resembles a great hall of Roman antiquity. The structure is 354 ft. long, 141 ft. broad and 100 ft. high. Its bronze doors, 34½ ft. high and 16 ft. wide, are by Triqueti and its high altar by Marochetti.

MADERA, the county seat of Madera Co., in central California, situated on the Fresno River, 23 mi. northwest of Fresno, served by the Southern Pacific and Santa Fe railroads. The city is in a fertile region, producing fruit, cotton, grain and live stock, especially dairy cattle. The chief manufactures are lumber products. Madera is a southern gateway to Yosemite National Park. Near by, on the east, is the magnificent scenery of the Sierra Nevada Mountains. Madera was founded by the California Lumber Co. in 1876; incorporated in 1907. Pop. 1920, 3,444; 1930, 4,665.

MADERO, FRANCISCO INDALECIO (1873-1913), Mexican President, was born at San Pedro, Coahuila, Oct. 4, 1873. He was educated at the University of California. Madero ran for governor in his native state in 1905 but was defeated by the Diaz machine. Attempting to run for President in 1910, he was imprisoned and after the elections escaped to Texas. In October of that year he recrossed the border proclaiming a revolution. He overthrew Diaz but was either too weak or naïvely honest to cope with the situation and was overthrown by Huerta and murdered by his guards in Mexico City, Feb. 22, 1913.

MADISON, JAMES (1751-1836), fourth President of the United States, was born at Port Conway, Va., Mar. 16, 1751, the first child of James Madison, one of the large landholders of Orange Co., Va., and Eleanor Rose Conway of Port Conway. English on both sides, he received his early education with Donald Robertson in King and Queen Co. and Rev. Thomas Martin, a Princeton graduate and rector of St. Thomas parish, who lived with the Madisons. He entered the sophomore class of Princeton at 17, graduated as Bachelor of Arts in 1771, and spent another year studying for the ministry under President Witherspoon but went no further toward a church career. At Princeton he founded in his first year "The American Whig Society." Always delicate, Madison injured his health by working too hard and allowing too little time for sleep. He was too diffident to speak in public but was notable for his brilliant conversation and President Witherspoon years later told Jefferson he had never known Madison "to say or do an indiscreet thing." Returning to Orange in 1772, Madison tutored his brothers and sisters, spending three somewhat unhappy years in this and gloomy pondering on theology.

But in 1775 he became chairman of the Orange Committee of Safety, wrote the Orange answer to "Captain Patrick Henry and the Gentlemen Independents of Hanover," and, thwarted by weakness from entering the army, as he desired, busied himself in recruiting. Elected to the Virginia Convention of 1776, he was one of the youngest members. On the committee to prepare a declaration of rights and plan of government, his chief contribution was an amendment dealing with religious liberty, which was not adopted. This forbade a state church or any state interference with religious matters. The pale, thin, delicate, modest, soberly dressed young scholar, 5 ft. 6¼ in. tall, as a member of the new assembly, met in Williamsburg in Oct. 1776, Thomas Jefferson, a fellow member, eight years older, successful lawyer, busy man of affairs, member of the second Continental Congress and author of the Declaration of Independence. They began their extraordinary 50-year friendship. Failing of reelection to the assembly in the spring of 1777, because he refused to follow the custom of treating the voters to rum and punch, Madison was elected by the assembly, Nov. 13, 1777, to the Council of State, and took his seat Jan. 14, 1778, prepared most papers for the governor's signature and was termed "Secretary of State."

Elected by the general assembly a delegate to the Continental Congress, he took his seat Mar. 20, 1780, and later in 1780 drafted very strong instructions to Jay to insist at Madrid upon free navigation of the Mississippi and upon the United States' succession to British rights under the Treaty of Paris of 1763. He urged Congress to forbid the states to issue more paper money, favored an amendment in 1781 giving Congress power to enforce its requisitions, another in 1783 giving Congress for 25 years authority to levy import duties and apportion interest on the national debt among the states in proportion to population, counting three-fifths of the slaves (Madison's own suggested ratio). Later, in 1783, he was author of a compromise plan for cession of western lands to the Confederation to which Virginia agreed.

Returning to Virginia in Nov. 1783, after refusing to be minister to Spain, upon expiration of his term in Congress, Madison, who had been jilted earlier in the year by beautiful 16-year-old Catherine Floyd of New York, took up the study of law, was elected to the Virginia house of delegates the next year. There his widely circulated petition of remonstrance caused the defeat of the general assessment for the Episcopal churches of the state. He opposed the further issue of paper money, tried to induce the legislature to repeal the confiscation of British debts, and secured the enactment of Jefferson's bill for religious freedom on Dec. 26, 1785. He promoted the Virginia-Maryland meetings at Alexandria and Mount Vernon in Mar. 1785 to settle their Potomac and Chesapeake boundary and navigation regulations, persuaded the Virginia legislature to invite all states to send commissioners to the Annapolis Convention of 1786, and there urged and secured the calling of the Philadelphia Constitutional Convention of 1787. His outline of a new system of government became the basis of the

"Virginia plan," the starting-point of the Convention's deliberations. Madison favored making the national government even stronger than the Constitution finally did, by giving Congress a negative on state acts and by giving the lower house of Congress power to elect proportional representation in the Senate from nominees of state legislatures. Always present in the Convention, speaking oftener than any others, except James Wilson and Gouverneur Morris, and keeping full and careful notes, Madison was a powerful influence in the framing of the Constitution. He was its chief defender in the Virginia ratifying convention and wrote 29 of the 85 numbers of *The Federalist* papers.

Madison defeated James Monroe for the seat in the House of Representatives from their district, and assumed a leading part in organizing the new government. His tariff bill along the lines of the impost measure of 1783 with protective duties added was passed by Congress. His resolutions for the establishment of executive departments of foreign affairs, treasury and war were enacted into law. Eight of the nine amendments to the Constitution proposed by Madison were passed by Congress with others, but the states failed to ratify two of these.

In the second session of Congress, in 1790, Madison favored funding the domestic floating debt but dividing payment between existing and original holders according to outlay of each; however, Hamilton's more practical plan of paying existing holders was adopted. Madison led the fight against national assumption of state revolutionary debts but yielded to expediency and acquiesced when southern members voted for assumption in order to have the national capital located on the Potomac. He joined Jefferson in unsuccessfully opposing Hamilton's bank bill in 1791, and this contest definitely placed Madison with Jefferson in favor of strict construction of the national constitution and against Hamilton's liberal or loose construction. Though he had not objected on constitutional grounds to protective duties in the tariff of 1789, Madison opposed vigorously Hamilton's proposed policy of protection in general for American manufactures. These positions taken in 1791-92 mark Madison's definite entrance into active leadership with Jefferson of the anti-Hamiltonian or Democratic-Republican Party.

Madison retired from Congress in 1797, vigorously opposed the alien and sedition laws, wrote the Virginia resolutions against them, and, as a member of the state legislature in 1799, wrote an elaborate report supporting the Virginia position. He had married Sept. 15, 1794, Mrs. Dolly Payne Todd, born in North Carolina of Virginia parents who had moved to Pennsylvania. Twenty-six when she married "the great little Madison," then 43, she participated very fully in his life thereafter and contributed greatly to his career. She was a decided social success in Philadelphia and Washington. They made their home at his birthplace, Montpelier, enlarged from the original four-room brick house into an imposing mansion.

Madison led the demand that Jefferson should be the Republican candidate to succeed Washington and took no notice of Jefferson's reply that Madison should be President. As Secretary of State for 8 years Madison cooperated with Jefferson as fully as secretary and president have ever done, helping by the Louisiana Purchase to settle his 20-year campaign for free navigation of the Mississippi, defending ably the neutral rights of the United States and following the policy of "peaceful coercion."

Nominated for the Presidency in 1808 in spite of a strong minority within their party for Monroe, Madison was elected by 122 votes to 47 for C. C. Pinckney. As President, he continued the Jeffersonian policies, for which he had been so much responsible, but gave up the peace policy and sent a message calling for war against Great Britain, June 1, 1812. Handicapped by the incompetence and disloyalty of his Secretary of State and forced to conduct the foreign affairs himself, he had exhausted all possibilities of non-intercourse, embargo and diplomatic negotiations and resorted to war with the backing of the majority of the Republicans and the bitter hostility of many Federalists. Congress had refused to follow Madison's recommendations to prepare for possible war and the nation was little prepared, so the earlier military and the later naval operations generally resulted unfavorably to the United States. Washington was captured, the Capitol, the President's house and the executive offices burned, the President and other national officers forced to flee into Maryland and Virginia. The President carried on the government and conducted the war with little assistance from his cabinet officers except Monroe. As a result of the great financial difficulties of the national government during the war and of the little help it received from the state banks, Madison signed in Apr. 1816, a bill incorporating the Second Bank of the United States, saying the nation seemed to have willed such a bank as constitutional.

In Mar. 1817, Madison retired from the Presidency and went to Montpelier to spend his last years in dignified retirement, as had Washington and as Adams and Jefferson were then doing. He steadily refused to recommend office-seekers, gave information freely but refused to be drawn into controversy. During the nullification measures in South Carolina, he denied vehemently that they were justified in the slightest by his and Jefferson's Virginia and Kentucky papers, and he wrote in his last year a long refutation of the doctrine of nullification. A rheumatic invalid for a number of years before he died (June 28, 1836), he worked on arrangement of his notes on the Constitutional Convention of 1787, was interested chiefly in agriculture, freeing of slaves and the slavery problem in general, and the University of Virginia. As rector of the University after Jefferson's death, he served until too feeble. He allowed himself to be elected one of the members from his county to the Virginia Constitutional Convention of 1829-30, nominated Monroe for chairman, and took an active interest in the proceedings. Inheriting a considerable



COURTESY METROPOLITAN MUSEUM OF ART

"THE IMMACULATE CONCEPTION"

This celebrated painting by Bartolome Esteban Murillo (1618-82) in the gallery of the Louvre, Paris, is one of the best beloved and widest known religious paintings in the world.

MADONNAS IN ART



1, 4. COURTESY METROPOLITAN MUSEUM OF ART

DEPICTIONS OF THE MADONNA BY GREAT MASTERS

1. "The Annunciation," by Roger van der Weyden (1400?-64). **2.** "Pietà," by Michelangelo (1475-1564), in the Church of St. Peter, Rome. **3.** "The Holy Family," by Bernardino Luini (1475-1535), in the Biblioteca Ambrosiana, Milan. **4.** "Virgin and Child Enthroned with Saints," by Raphael (1483-1520).

estate from his father, he added to it, as had Washington; and was also a careful and efficient manager, but his almost continuous employment in public office with small or moderate salaries and inadequate expense accounts and irregular payments, and the generous hospitality dispensed by the Madisons to an ever-increasing flow of visitors, brought about financial embarrassments in his old age. Being refused a large long-time mortgage loan by the U.S. Bank in 1825, he had to sell some land and stocks. His liberality to his own and Mrs. Madison's nieces, nephews and other relatives and especially the constant drain of the gambling and extravagance of her son, John Payne Todd, added much to the usual expenses of a large owner of land and slaves and of a retired statesman always entertaining visitors. Madison had no children.

E. J. W.

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MADISON, a village in Madison Co., eastern Illinois, one mile from St. Louis, Mo. Three railroads afford passenger service, and several others have freight connections with the city. Madison has car-building shops and steel mills. The village was incorporated in 1894. Pop. 1920, 4,996; 1930, 7,661.

MADISON, a city in southeastern Indiana, county seat of Jefferson Co., situated on the Ohio River, 40 mi. northeast of Louisville, Ky. Bus and truck lines, river craft and the Pennsylvania Railroad afford transportation. There is an airport. The city has furniture, cotton cordage, glue, tack and various other factories. It is a distributing market, shipping chiefly grain and tobacco. Hanover College is located six mi. west. Clifty Falls State Park is near by, as is also the Lanier Home, a memorial to J. F. D. Lanier, an Indiana banker who financed the State during the Civil War. Madison was laid out in 1808. Pop. 1920, 6,711; 1930, 6,530.

MADISON, a borough of Morris Co., N.J., situated on the Lackawanna Railroad, 26 mi. west of New York City. It is mainly a residential suburb of New York City and Newark. Drew University, founded in 1866 as Drew Theological Seminary at the instigation of Daniel Drew, is located in Madison. The borough is the trading center for an area of large country estates. The cultivation of roses and chrysanthemums is the single important local industry. Pop. 1920, 5,523; 1930, 7,481.

MADISON, the capital city of Wisconsin and county seat of Dane Co., is situated in the south central part of the state, about 82 mi. west of Milwaukee and 131 mi. northwest of Chicago. Transportation facilities include the Chicago, Milwaukee, St. Paul and Pacific, the Chicago and Northwestern and the Illinois Central railroads. Located on a hilly wooded isthmus about 1 mi. wide, between Lakes Monona and Mendota, near two other beautiful lakes, Kegonsa and Waubesa, in the district known as the "Four-Lake Region," Madison is a famous summer resort. The state capitol is in the center of the city; near its western margin are the grounds of the University of Wisconsin, comprising 300 acres, and also an imposing building housing the State Historical Society. Madison has an extensive trade in garden, farm and dairy products and is a jobbing center for central Wisconsin. The manufactures include agricultural implements and tools, flour and hospital furniture and fixtures. In 1929 the value of manufactures was approximately $38,000,000; the retail trade amounted to $46,760,037.

Formerly Winnebago Indians inhabited the Four-Lake Region, but in 1825, the United States acquired title. Stevens Mason and James D. Doty recorded a tract in 1836 which included most of the present site of Madison and planned a city which they named for James Madison. In Dec. 1836, the territorial legislature made Madison the capital of Wisconsin. Pop. 1920, 38,378; 1930, 57,899.

MADISONVILLE, a city in western Kentucky, county seat of Hopkins Co., situated about 90 mi. southwest of Louisville, in the western coal fields of the state. Bus lines and two railroads afford transportation. Madisonville is the metropolis and market for a coal-mining, lumbering and dark tobacco-growing region. Corn is also an important crop. Near by is the town of Dawson Springs, noted for the medicinal value of its waters, and the seat of a United States Veterans' Hospital. Madisonville was founded and incorporated in 1807. Pop. 1920, 5,030; 1930, 6,908.

MADONNAS IN ART. Madonna is the name the Italians have always called MARY, and as they have given us the loveliest conceptions of her in painting and sculpture, it is the name that the mother of Christ is always known by in art. The honor paid to the Virgin has always had great theological value in emphasizing the doctrine of the complete union of the divine and human nature in the person of Christ. She is always given place next to that of her divine son. In art she appears first in the CATACOMBS as the lowly hand-maiden of the Magnificat but in the Constantinian bascilicas she is raised to the position of intercessor, empress and priestess. In the 5th century she is portrayed in a great mosaic in S. Maria Maggiore at Rome as queen of heaven, gorgeously robed and adorned with jewels. A mosaic of the 6th century in S. Apollinare at Ravenna presents her as the Virgin and Child enthroned. The obliteration of all images and pictures of the Virgin for two centuries by the iconoclasts and again by the Mohammedans deprived civilization of some of the finest examples of early Christian sculpture. The culmination of the Byzantine style of madonna, the universal and impersonal type of motherhood, is found in the work of Duccio and Simone Martini at SIENA, and the famous enthroned madonna by Cimabue in S. Maria Novella at Florence, executed in the 13th century. The Sienese school developed a type of madonna founded on the Byzantine mold, into which was instilled the new naturalistic spirit, but always

there was the mystic, impersonal veil enveloping it, in spite of its beauty and sweetness. It was to the Umbrian school that lovers of the madonna owe the humanized representation flooding the world with the passionate tenderness of her pure soul. It was from this source that RAPHAEL formed his conception of the madonna, of whom he painted a series of twenty. To many the madonna of Luini is the most appealing of all types. Here he seems to have appropriated all the magic skill of LEONARDO DA VINCI and stamped it with his own inner vision. The madonnas of FRA ANGELICO have been called spiritual rainbows, because of their prismatic, tinted angel wings. The lily always appears in paintings of the Annunciation, after the 14th century, as the emblem of purity. In the history of Christian art it is scarcely possible to find a painter of note who had not portrayed the Virgin in some aspect. The *Madonna of the Magnificat* by SANDRO BOTTICELLI has an elusive charm that is not wholly of the spirit, and his work marks the turn of religious spirit toward the secular, although the subjects often remained sacred. The cult of the Virgin was an important aspect of the Gothic period and everywhere in the cathedrals she is presented.

MADRAS, the third largest city in India, the capital of Madras Presidency, and in value of trade the fifth and last of the large seaports. The city and its suburbs, situated in 13° 4′ N. lat. and 80° 15′ E. long., stretch 9 mi. coastwise and 3½ mi. inland.

On the east coast of India there are no natural inlets which are suitable for harbors, yet there are many small ports along the coast. At nearly all of them except Madras steamers have to anchor some distance off-shore and land goods and passengers in small boats. The landing is often dangerous, owing to the line of surf. Madras is the only port which has a modern artificial harbor, built at great cost and only finished in 1909. Running north and south through the district is a salt-water canal nearly 250 mi. long, which obviates a passage for small craft along the stormy coast. The principal export is leather, and the tanning of hides and skins is an important local industry. There are also numerous cotton mills; cotton goods and raw cotton are exported.

Many beautiful buildings are on the Marina, which runs along the sea-face from the Napier Bridge southward. Here are Chepauk Palace, now used as a government building, the College of Engineering, the Senate House of Madras University, created as an examining corporation in 1857. Farther north are the Law Courts, surmounted by the lighthouse 166 ft. above sea-level, and the Law College. The foundation stone of the Luz Church bears the date 1516, and the St. Thomé Cathedral contains memorials of the Portuguese, dating from 1557. The city is protected by Fort St. George, one of the earliest strongholds of the East India Company, and at present one of the arsenals of the empire. In its vicinity, on the coast, are the rock-cut temples of Mahabalihuran, celebrated by Southey's poetry. Pop. 1921, 526,911; 1931, 647,225.

MADRID, the second largest city in Spain, capital of the country and of the province of the same name. It is situated on a plateau, with an altitude of 2,140 ft., in an arid plain, on the east bank of the Manzanares River, near the middle of the Republic. Madrid was a Moorish city until late in the 11th century, when it was captured by the Spaniards (*see* SPAIN, HISTORY OF). Henry IV established a hunting-lodge at Madrid and in 1560 Philip II made it the capital. The majority of the buildings date from the beginning of the 17th century. In 1868 the walls of the old town were destroyed. The present city is laid out around a central plaza, La Puerta del Sol, from which the ten most important streets radiate. The art gallery, the Museo del Prado, contains one of the most valuable collections of paintings in the world. The National Library contains hundreds of thousands of volumes and manuscripts. Other interesting buildings are the former Royal Palace and Armory. In the latter are a part of the armor used by Columbus and Cortez. There are numerous theaters and a bull ring. The UNIVERSITY OF MADRID is the chief institution of Spain.

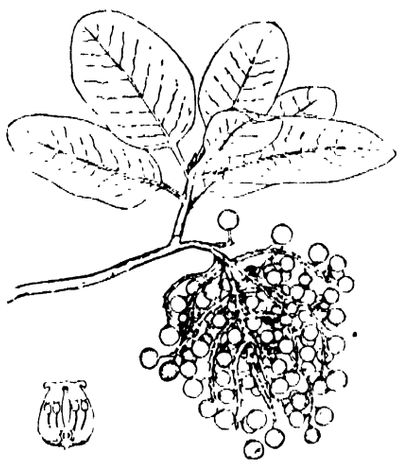
A cosmopolitan character is given to Madrid by its celebrated promenades, arteries of wealth and fashion, which include the Prado, the Paseo de Recoletos and the Paseo de la Castallana, lined by government and civic institutions and by imposing residences. On the east side of the city is the Park of Madrid and Botanical Garden, or Buen Retiro, covering 260 acres. The most noteworthy churches are those of St. Francis the Great, 1784, and San Jerónimo. Shoes and other leather articles are the chief manufacturing products; although trinkets, ceramics, pottery, preserves and alcoholic beverages are also manufactured. Est. pop. 1929, 825,471.

MADRID, UNIVERSITY OF, the largest university in Spain, situated at Madrid. It developed out of the College of Doña Maria de Aragon, founded in 1590 by Alphonso Crozco, to which were added in the 16th-17th centuries faculties of natural science and mathematics and, in 1786, the College of San Carlos for the study of medicine and surgery. The institution assumed real importance, however, only in 1836-37, when the famous University of Alcalá de Henares, founded in 1510, moved to Madrid and was united with it. Thenceforth ranked as the leading university in Spain, it has continued to be best known for its schools of law and of medicine. It is well equipped with museums, laboratories, clinics and a library of 270,000 volumes, and it has its own preparatory school, San Isadoro, founded by Philip IV. The number of students is about 3,000. In 1930 the faculty of 243 was headed by D. Blas Cabrera.

MADRIGAL, in music, an unaccompanied polyphonic setting of a lyrical poem. For centuries prior to the development of instrumental music as an independent art, roughly about 1650, music was almost exclusively vocal, instruments being used for mere accompaniment in the majority of cases. However, in many other cases, instruments were not used at

all. Thus arose the necessity of having voices accompany one another, and accordingly there arose the MOTET, the GLEE, and the madrigal, the last an instrumentally unaccompanied vocal composition, set to pastoral lyrics or to love poems, for a chorus treated in the contrapuntal manner. Flemish composers, noted for their contrapuntal skill during the 14th, 15th, and 16th centuries, were particularly active in this field; but throughout Europe and in England there soon arose a host of imitators who also proceeded to do for secular vocal music what the church composers were doing for sacred. They created that large body of secular polyphonic works for unaccompanied voices of which the madrigal is a generous representative, finding even wider favor than the glee in that it did not confine the parts to solo voices.

MADRONA (*Arbutus Menziesii*), a handsome evergreen tree of the heath family found on the Pacific coast from British Columbia to southern California.



FROM JEPSON, MAN FL. PLANTS CALIF., COPYRIGHT

MADRONA

Fruiting branchlet and section of flower

It grows 80 to 125 ft. high and sometimes 4 to 5 ft. in diameter, with a straight trunk bearing large, oblong, leathery leaves, small white flowers in dense clusters and showy, orange-red, berry-like fruit. The hard brownish-red wood is used for making furniture and charcoal.

MAD-TOM, the name given in North America to a genus (*Schilbeodes* or *Rabida*) comprising several diminutive fishes of the CATFISH family, found chiefly in rocky streams in the eastern United States. They are mostly of very small size, ranging from 3 to 5 in. in length, and are characterized by having a poison sac at the base of the breast spine, which renders its sting exceedingly painful. Because of their mottled coloration various species make very attractive aquarium fish.

MADURA, an island of the Dutch East Indies. It is separated from Java by the narrow Strait of Madura and is about 100 mi. long and 25 mi. wide. Its area is about 1,700 sq. mi. The highest part of the island is about 1,500 ft. above sea level. The topography is uneven. The inhabitants are engaged chiefly in raising cattle. Salt manufacture, a government monopoly, is the most important industry. Coffee, coconuts, maize and cocoa are grown. Pamekasan is the capital and chief town. Madura is included in the government of Java. Est. pop. 1931, 1,800,000.

MADURA, a city of British India in the Madras Presidency, situated on the River Vaigai, 72 mi. southwest of Trichinopoly. This ancient city was the capital of the southernmost part of India for almost 2,300 years. It contains magnificent temples and other monuments of Hindu art. The palace, built by Terumala Nayak, a former ruler, is the finest structure of its kind in India, and has vast arcades, courtyards, vestibules, reception chambers and halls with vaulted roofs and arches. The inhabitants are engaged particularly in the weaving of muslin and dyeing. Rich, irrigated land is extensive in the vicinity. Pop. 1921, 138,894; 1931, 182,007.

MAECENAS, GAIUS CILNIUS (d. 8 B.C.), Roman patron of letters, was born between 73 and 63 B.C., of a noble Etruscan family. He was possessed of vast wealth and an excellent education. Until the latter years of his life he enjoyed the intimate friendship of Caesar Augustus, under whom he won distinction as a statesman. It is as a patron of letters, however, that the name of Maecenas is chiefly celebrated. Many of the literary men of his time, among them the poets VERGIL and HORACE, were indebted to him for material aid. His magnificent palace was a rendezvous for all the leading Roman intellects, and he himself wrote admirable prose and poetry. Maecenas died in 8 B.C.

MAELSTROM, the name originally given to the treacherous whirlpools and the strong current of the Moskenstrom, between the islands of Mosken and Moskenas in the Lofoten, along the Norwegian coast. The word is undoubtedly derived from the Dutch *malen,* meaning to grind, and is now more generally applied to whirlpools elsewhere. Although dangerous to navigation, its perils have been highly exaggerated, especially in such fanciful tales as those of Edgar Allan Poe, and the stories of ships and whales being sucked down and swallowed up by the vortex are undoubtedly untrue.

MAERLANT, JACOB VAN (1235-c. 1300), Flemish poet, was born probably at Maerlant on the Island of Voorne, about 1235. He is known as the "father of the Dutch poets." His *Rhymed Bible,* 1271, was very popular in Flanders, but his chief work is the *Mirror of History,* 1283-1300, an adaptation from the work of Vincent of Beauvais. Maerlant's importance in Dutch literature arises from the fact that he opposed French literary influence. The poet died at Damme, near Bruges, about the end of the 13th century.

MAETERLINCK, MAURICE (1862-), Belgian author, was born at Ghent, Aug. 29, 1862. After education at the University of Ghent where he studied law he decided to devote himself to literature. Ample wealth enabled him to follow his bent, and his literary career began in 1889 with the publication of a

play and a volume of verse. He has written a great deal, including many dramas in prose and verse, and numerous volumes of poetry, essays and esthetic philosophy. During the first period of his literary production he was much occupied with mysticism, and his treatment was more or less symbolic. In all his works he is the expositor of both sensual and spiritual beauty. Among his plays are *The Blind, Pelleas and Melisande, Monna Vanna, The Blue Bird, The Burgomaster of Stilemonde,* a war play, and in modern settings, *The Cloud that Lifted* and *The Power of the Dead. The Treasure of the Humble* is a philosophic and esthetic work, and *The Life of the Bees* is a combination of natural history, poetic fancy and imaginative interpretation. It has been widely read and much admired because of its beauty and poetic quality.

MAFFEI, FRANCESCO SCIPIONE, COUNT (1675-1755), Italian historian, archaeologist and playwright, was born at Verona, June 1, 1675. He studied at Parma, and decided on a literary career. Failing in his attempts at literary journalism he turned his attention to the stage in 1713 and produced *Merope,* a tragedy of mother love, praised as the best Italian tragedy before Alfieri. Although his name is thus connected with the revival of tragedy in Italian literature, Maffei is also highly regarded for archaeological investigations, and for considerable attainments as a scholar and historian. Best known in this connection are *Diplomatic History* (1727) and *Literary Observations* (1732-40). Maffei died at Verona, Feb. 11, 1755. A collected edition of his works was issued in Venice in 1790.

MAFIA, a loosely organized Italian criminal group extremely powerful, particularly in Sicily, during the 19th century. Originally organized by the great land holders to maintain some sort of unofficial order in the breakdown of government resulting from Napoleon's Italian wars, it soon outgrew the intention of its founders. The code of the Mafia was purely unorganized, though extremely rigid, and as much of the time of the members was taken up fighting each other as in preying upon the rest of the community. Appeal to the police for redress or protection was the worst crime in the eyes of the Mafia. The Italian Government made numerous vain attempts to stamp out the organization; but the prosecution always collapsed from the popular dread of testifying against the members. In 1927 the Government overcame this fear and broke up the organization by arresting suspected members in blocks of hundreds, leaving none free to terrify witnesses.

MAGALLANES, formerly Punta Arenas, a town of Chile and capital of the territory of Magallanes, situated on the Straits of Magellan. At 53° 10′ S. lat. Magallanes is distinguished as the most southern town in the world. It is in one of the most cold, wind-ridden and bleak regions of the continent, more than 1,000 mi. from any other city of importance. It is, nevertheless, a harbor important as a coaling station to the ships entering the straits. The sheep industry is carried on extensively in this district; much wool and meat are exported yearly. Nearby are dense forests with unlimited timber resources. There are many miles of splendid highways to surrounding villages. Pop. 1930, 24,307.

MAGAZINES, on warships, compartments where powder charges in cylindrical metal tanks or in cartridges are normally stored for sending up to the guns through ammunition hoists. They are fitted with flame-proof doors, sprinkler systems and flooding valves that are located below the water-line as well protected as possible. Ready-service magazines, and ready-service ammunition boxes, often are provided for keeping small amounts of ammunition conveniently close to the guns. Magazine buildings at Ammunition Depots are fire-proof, and new magazine buildings for high explosives sometimes are partly covered with earth embankments.

MAGDALENA, a river of Colombia. It rises in the central chain of the Andes in about 2° N. lat., and reaches the Atlantic after a course of approximately 1,060 mi., of which 960 are navigable. It traverses nearly three-fourths of the central part of Colombia, and by means of its tributaries taps many of the most thickly populated of the agricultural and industrial regions. Broadly speaking, the river is navigable for large steamers up to Honda, a distance of 600 mi.; for small steamers from above Honda to Neiva; for boats and rafts up to the confluence of the Paez. Much dredging, however, is required in the lower reaches before large vessels can enjoy a free course all the year round.

MAGDALENIAN CULTURE, the stage of culture found in the last stage of the Upper Palaeolithic Period. It is represented by discoveries at La Madeleine in the department of Dordogne, southwestern France. Characteristic of the Magdalenian stage are long ribbon-like flint knives, flakes detached from the nodule by a single blow, some being from 8 to 10 inches long. There are also fine implements of bone, horn and ivory, which include so-called assegais and dartheads, and barbed harpoons, generally of reindeer horn, sometimes of bone.

To this stage belong harpoons with two or more barbs on one or both sides, and instruments of horn or bone, variously described as scepters or batons; their real use is unknown. Notable are finely made bone and ivory needles, in which the eye has been skilfully drilled with a fine pointed flake of flint. Ivory carvings of animals are numerous. Painting on cave walls was carried on from the Aurignacian stage. (*See* Aurignacian Culture.)

The Magdalenian people resembled the Cro-Magnon type, though were not so tall. Their stations have been found in north Spain, France, Belgium, Czechoslovakia, Switzerland, Germany, Austria, south Russia and south Britain. *See* Archaeology.

MAGDEBURG, a Prussian city, capital of the province of Saxony, situated on the Elbe, 88 mi. southwest of Berlin, where the river divides into three arms. The city was started by Otto the Great, who founded the archbishopric in 968 and built a cathe-

dral in what had been in 806 a trading post with the Slavs across the Elbe. His wife, Editha, an Anglo-Saxon princess, founded a Benedictine abbey. The city was one of the most flourishing of the 13th, 14th and 15th centuries; it became a leading member of the Hanseatic League in the 13th century. The citizens gradually made themselves independent of the archbishops, who later usually lived outside the city. It accepted the Reformation and was devastated by General von Tilly after a long struggle. Otto von Guericke, inventor of the air pump, was city councillor and later became mayor. After the Thirty Years' War Magdeburg fell to Brandenburg. The imposing cathedral, dedicated to Saints Maurice and Catherine, is a fine example of the transition from Romanesque to Gothic; and the former Cloister of Our Lady, now a school, is a Romanesque survival of the 11th century. Madgeburg is a flourishing industrial city with large machine factories, sugar refineries, chicory factories and other plants. It is the center of the German beet-sugar trade and, aided by the active shipping on the Elbe, trades extensively also in other staples. Pop. 1925, 293,959.

MAGEE, WILLIAM M. (1885-), American educator, was born at Chicago, Ill., July 9, 1885. He was graduated from St. Ignatius College, Chicago, 1906, and from St. Louis University 1913. For five years he was on the faculty of St. John's University, Toledo, O. In 1923 he became professor of philosophy at Marquette University, Milwaukee, Wis. He was later dean of the College of Liberal Arts, and in 1928 became president of the university.

MAGELLAN, FERDINAND (c. 1480-1521), Portuguese navigator, was born at Saborosa, Traz-os-Montes, Portugal, about 1480. He fought with distinction for the Portuguese in the East Indies, 1505-13, and in Morocco, 1514. Feeling that he had not been duly rewarded by Portugal, he made an offer to Spain to find a western route to the Moluccas. Charles V supplied five ships and 265 men. The squadron sailed from San Lucas, Sept. 20, 1519, and on Oct. 21, 1520, entered the strait called by Magellan *Todos Los Santos,* but which now bears his name. On November 28, the expedition entered and named the Pacific Ocean. The Philippines were discovered and claimed for Spain, Mar. 16, 1521. Magellan was killed in the Philippines in a fight with the natives of Matan, Apr. 27, 1521. One of the five original ships with but 18 men aboard finally reached Europe, completing the first trip around the world.

MAGELLAN, STRAIT OF, a narrow winding passage between the Atlantic and Pacific oceans, separating the island of Tierra del Fuego from the southernmost part of the South American continent. The strait is about 350 mi. long and varies in breadth from 3 to 12 mi. At the eastern entrance are Cape Virgin and Cape Espieritu Santo and the western termination is formed by Cape Pillar. The strait is subject to rough weather which makes it difficult to pass through. It was discovered in 1520 by MAGELLAN, a Portuguese explorer in the service of Spain.

MAGELLANIC CLOUDS, the name given to two heavenly objects in the neighborhood of the south celestial pole, which somewhat resemble portions of the MILKY WAY. The Large Cloud appears as an oval spot, 3°.6 by 1°.2 in size, with faint extensions to a diameter of about 7°; the Small Cloud has a dense portion 2° by 1° in size and an outer diameter of 3°.6. They are both vast stellar systems, the Large Cloud at a distance of probably a little over 100,000 light years, and actually some 14,000 light years in diameter; the Small Cloud slightly nearer, and only 6,000 light years across.

Both clouds are exceedingly rich in variable stars and contain many types of objects that are otherwise found only in the Milky Way. The radial velocities of the two clouds have been measured and indicate that the Large Cloud is receding from us at a speed of about 170, the Small Cloud with a speed of 100 miles per second. It is possible, but not yet settled, that both clouds are to a certain extent satellites of the Milky Way system. W. J. L.

MAGENTA, BATTLE OF, a military action between the French and Sardinian forces commanded by Napoleon III, and the Austrian armies, under General Franz Gyulai, which occurred on June 4, 1859, at Magenta, in Lombardy. The Franco-Sardinian forces numbered 52,000, and the ill-equipped Austrians about 60,000. The result of the battle, in which the French lost 246 officers and 3,463 men, and the Austrians 281 officers and 3,432 men, was to give the French entry into Milan.

MAGERSFONTEIN, ACTION OF. *See* SOUTH AFRICAN WAR.

MAGGIORE, a lake of northern Italy, the largest in this region. It is 40 mi. long, has a maximum width of 5½ mi. and an area of 83 sq. mi. The surface of the lake is 635 ft. above sea level and its maximum depth reaches 1,220 ft. About one-fifth of the lake belongs to Switzerland. Maggiore is properly an expansion of the River Ticino which traverses it from north to south on its way to the Po. The shores of Lake Maggiore are lined with summer villas and it is famous alike for the picturesqueness of its banks and for its beautiful islands. The town of Laveno is situated on the eastern shore and Locarno on the northern.

MAGGOT, a popular term properly applied to the larvæ of two-winged flies of the order *Diptera.* Also extended to the footless grubs of various other insects. Those species that live in manure or in carrion are useful as scavengers. Others are pests on cultivated plants, especially apple, onion, cabbage, wheat, cherry, carrot and seed corn. As these pests all work inside the plant or fruit tissues they cannot be reached by spraying. Repellents are useful to protect vegetable crops. Cattle, hogs and sheep eat fallen fruit and poultry get maggots that crawl to pupate.

MAGI, the members of a priestly caste among the ancient Medes and Persians. More commonly the Magi were the Three Wise Men of the East or the Three Kings of Cologne who, following the star to

Bethlehem, paid homage to the new-born Christ. The oldest of the three, Melchior, made an offering of gold; the young Gaspar gave frankincense; and Balthazar, the Moor, offered myrrh. Cologne Cathedral claims the relics of the Magi.

MAGIC, the general system of belief and practice by which events are explained and control sought in mystic relations. The magical is the pre-scientific stage of conceiving the events of nature and their relation to human fate. Typical products of the magical view of the universe are DIVINATION, the belief in spirits, and the control of forces by penetration of the secrets of nature, thus performing wonders. The magician was the thaumaturgist or wonder worker; the semblance of like feats by sleight of hand and ingenious devices developed the art of the conjuror, still known as the magician.

Primitive man was surrounded by forces whose workings he feared and could not understand. He conceived them as acting after the pattern of his own motives. Deities, demons, beings of superior power, they had to be appeased and their aid sought. Cause and effect in the physical sense were in many fields secondary to the procedures of a psychic nature. Congenial to this view were the elaborations of ancient, medieval and later systems, such as ASTROLOGY, ALCHEMY, WITCHCRAFT and spirit-agency. The sorcerer commanded magic knowledge and power; when using it for evil he was accused of black magic or NECROMANCY. The magician was an occultist (*see* OCCULT) and would resort to formulae, alembics and crucibles, as well as incantations and intercourse with spirits.

The arts of magic in the general sense comprise the entire range of beliefs and practices which characterize early stages of the concepts of natural and spiritual forces. It is associated with the search for the supernatural, and many of the notions developed under that view survive in superstitious form. *See* SUPERSTITION. J. J.

MAGIC FLUTE, THE, an opera in two acts by WOLFGANG MOZART, libretto by Gieseke and Schikaneder; première, Vienna, 1791, Paris, 1801, London and New York, 1833. It was Mozart's operatic swan song, composed during the last year of his brief life. Of his score of operas it is possibly the most popular.

Sarastro, high priest of the Egyptian goddess Isis, has carried off Pamina in order to save her from the evil influence of her mother, Astrofiammante, Queen of the Night. Tamino, an Egyptian prince, falls in love with a picture of Pamina, and Astrofiammante tells him that he may have her daughter in marriage provided he delivers her from Sarastro's clutches. He therefore sets forth, accompanied by Papageno, a bird-catcher who is garbed in feathers. Tamino is given a magic flute to protect him from danger, while Papageno is given a set of bells for the same purpose. Upon reaching Sarastro's Temple of Wisdom they find Pamina pursued by Monastatos, a Moorish attendant, who is temporarily frightened by Papageno's strange feathery dress. Pamina and her two would-be rescuers, however, are caught and brought before Sarastro. He tells the lovers that they may be married only after they have passed through a test of purification, an ordeal of fire and water and silence. This they do gladly and are eventually united by the priest of Isis. Baffled by the light in the Temple of the Sun, Astrofiammante sinks ignominiously through the floor.

MAGIC LANTERN. An optical instrument for projecting an image on a screen. It consists of a source of light, properly enclosed, part of whose rays fall upon a powerful condensing LENS which makes the light convergent. The light then passes through the "slide," or transparent picture, to be projected, and then through a system of lenses which finally produce a greatly enlarged image on a screen placed at some distance. *See also* STEREOPTICON.

MAGIC SQUARES AND CIRCLES. A magic square is an array of numbers in the form of a square such that the same sum is obtained from the addition of the numbers in any row or column or in either diagonal. While of great antiquity, magic squares have always been an object of widespread interest and of study, not only in the field of mathematics but in philosophy and art.

There is a tradition in China that when the great emperor Yu (*c.* 2200 B.C.) was standing by the Yellow River, there appeared a divine tortoise. On its back were two mystic symbols, one of which was the array of numbers shown in Fig. 1. In accordance with the definition stated above, the sum of the elements of any row or column or of either diagonal in the ancient example here given is 15.

To-day this oldest and simplest of squares is found in many Chinese works. Every fortune teller of the East makes use of it in his trade and, engraved on stone or metal, magic squares are worn throughout India as talismans. During the Middle Ages, the subject received considerable attention from astrologers and mystics, but gained no recognition as a Christian symbol. It made an appearance in art when Albrecht Dürer in his famous etching "Melancholia" used, among other symbolic objects, the 16-celled square (Fig. 2) in which, as a matter of added interest, the two numerals in the center of the lowest row represent the date of the etching (1514). In modern times magic squares hold a prominent place not only as

4	9	2
3	5	7
8	1	6

FIG. 1

16	3	2	13
5	10	11	8
9	6	7	12
4	15	14	1

FIG. 2

17	24	1	8	15
23	5	7	14	16
4	6	13	20	22
10	12	19	21	3
11	18	25	2	9

FIG. 3

puzzles and mathematical recreations, but also in the field of design, which has been greatly enriched by the recent development of magic lines.

As a mathematical problem interest centers in the existence of a rule by which a square of any order may be constructed, and in the number of arrangements which may be made for a given number of cells. For odd-numbered squares the following is one of several known methods. In Fig. 3 we place one in the middle cell of the topmost row, and then write the consecutive digits in the natural order, proceeding always diagonally upward to the right. On reaching the upper margin, we write the next digit in the lowest space of the column next to the right and, similarly, on reaching the right-hand margin we continue from the left margin in the row just above. If a number is assigned by this rule to a cell already occupied, we place it in the cell directly beneath the last one filled. The method can be traced in the square of the fifth order here shown.

A more general method applicable to even- as well as to odd-numbered squares is ascribed to de La Hire, a mathematician of the 17th century. It has the advantage of producing many arrangements for a square having a given number of cells. The ideal answer to the problem of finding a general law of formation has not been written, however.

Once a magic square has been constructed, special properties other than those of the original definition are frequently found to exist. Thus it is possible to form the most perfect of magic squares, one in which the broken diagonals as well as the two principal diagonals, the rows and columns sum to a constant. This is known as the Nasik square, named by the Rev. A. W. Frost, its discoverer, after the town in India where he resided. Then there is the associated square, closely allied with chess problems, in which the sum of two numbers equidistant in a straight line from the center is constant. A bordered square, as its name implies, has the property that if one or more bordering rows be removed from each side, the inner square will be magic. These are illustrated in Figs. 4, 5 and 6.

1	14	7	12
15	4	9	6
10	5	16	3
8	11	2	13

FIG. 4
NASIK SQUARE

4	5	6	43	39	38	40
49	15	16	33	30	31	1
48	37	22	27	26	13	2
47	36	29	25	21	14	3
8	18	24	23	28	32	42
9	19	34	17	20	35	41
10	45	44	7	11	12	46

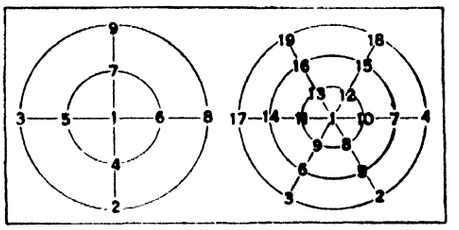
FIG. 5
BORDERED SQUARE

1	14	12	7
8	11	13	2
15	4	6	9
10	5	3	16

FIG. 6
ASSOCIATED SQUARE

The notion of forming arrays of numbers fulfilling certain arbitrary requirements has also been carried over to other plane figures such as triangles, rectangles and pentagons and to such solid figures as cubes. Not only do there exist magic polygons but magic circles, oriental companions of the square. The accompanying Fig. 7 gives examples from a Japanese text.

We note that in each case n concentric circles are divided into equal parts by n diameters. The problem then is to place consecutive integers at the intersections so that the sum of the digits along each circle will be the same, one being placed at the center of the circle.



JAPANESE MAGIC CIRCLES

For the first magic circle shown the constant sum is 22, while for the second it is 63.

In his book, *Projective Ornament,* Claude Bragdon prefaces his chapter on magic squares with the statement: "The numerical harmony inherent in magic squares finds graphic expression in the magic lines which may be traced in them. These lines, translated into ornament, yield patterns often of amazing richness and variety, beyond the power of the unaided sense to compass." He defines a magic line as "that endless line formed by following the numbers of a magic square in their natural sequence and returning to the point of departure. He has used magic lines in designs with new and beautiful results. When one reflects that for a square of 16 cells, 880 arrangements are possible, each with its magic line, while for cells of higher order, the number mounts with unbelievable rapidity (for the square of order 7, it is 363,916,800), one realizes what a tremendous field is opened.

Again the answer to a problem which is proposed for no immediate end but because of idle curiosity gives new evidence of a divine law of order and symmetry and fulfills an unforeseen purpose both practical and aesthetic. H. K.

MAGLEMOSEAN CULTURE, the stage of culture represented by the lake settlement on the peat moss called Maglemose, near Mullerup on the island of Seeland, Denmark. Henry Fairfield Osborn dates this settlement some 10,000 years ago, before the coming of the Nordic race to Scandinavia. Sweden was then joined to south Denmark, what is now the Baltic Sea being a fresh water lake, named by geologists Ancylus Lake from the dominant mollusk.

When the settlement was begun the peat moss was a large lake. Of its inhabitants there remain only a broken thigh bone, a finger joint and a child's jaw. The dog had been domesticated. There are implements of stone, bone and horn, but no pottery. The horn implements include axes and hammers, perforated to receive wooden handles; chisels, knives and harpoons. There are fishing hooks of bone or horn. Moose, stag, roe and wild cattle were hunted. The axes were used to fell trees, to hew the logs and to hollow out log canoes. Implements have been found for the making of fishing nets. Harpoons are numerous, some of them being decorated with incised lines.

The difficulty in obtaining flints was made up for by the abundance of bone weapons. *See* ARCHAEOLOGY.

MAGMA, a molten fluid in the earth's interior which gives rise to volcanic action, or VOLCANISM, and solidifies into IGNEOUS ROCKS. Magmas arise in the ASTHENOSPHERE, or near-surface shell of the earth, because this region is unable to transmit outward the heat received from the zone below, the stereosphere, as fast as it arrives. As a result there is a local rise in temperature sufficient to liquefy portions of the otherwise solid substance which is then forced toward the surface by pressure of surrounding material.

Magmas contain volatile substances and gases, such as steam, carbon dioxide, acids and sulphur, and solid materials, principally silica and the oxides of the metals aluminium, iron, magnesium, calcium, sodium and potassium. They may be roughly divided into two classes: those in which silica, sodium and potassium predominate form the ACID ROCKS, while the ones high in calcium, iron and magnesium form the BASIC ROCKS. If the rising magma reaches the surface through some type of vent, a volcanic eruption results. The acid lavas, or magmas, are usually viscous, and characteristic of explosive volcanic eruptions, such as in Mont Pelée, while the more fluid, basic ones produce the quiet type of lava outflow seen at Kilauea.

When a magma cools, either within the earth as an intrusion, or as an outflow or extrusion of lava, the oxides above mentioned combine to form the common rock-making minerals, and the coarseness of the crystallization of the rock will depend on the rate of cooling. Deeply buried, large bodies cool slowly and produce coarsely crystalline rocks, as granite or gabbro, while smaller bodies cool quickly with the result that large crystals do not have time to grow, and felsites or basalts result. *See also* GEOLOGY; ABYSSAL ROCKS.

MAGNA CARTA. The grant by King John of England of the schedule of reforms demanded by the barons in 1215 was a charter drawn up in the form regularly used for grants of land. First because of its length, it contains sixty-three chapters, and later because of its importance, it acquired the designation Magna Carta, and Great Charter. It deals in confused order with a wide range of subjects, including the Church, feudal rights, law and justice, taxation, the seizure of property, the forests, popular interests, and temporary evils. Because of John's abuse of power the barons had cast off their allegiance and taken up arms against him; Magna Carta was a guarantee that for the renewal of their homage and fealty the King would grant to the freemen of England and their heirs the liberties and privileges therein enumerated. These were not new; the document rests on the foundation of the feudal contract, which the king had violated and which would be renewed only on condition that he hereafter respect the rights of his vassals. In some measure Magna Carta was a reactionary instrument, designed to further the selfish aims of the baronage. Yet in it the barons embodied the innovations of Henry II that widened the royal jurisdiction; they promised to extend to their tenants the rights they claimed for themselves; and they secured something for the cities and towns that had supported them.

Several times reissued, and often appealed to as a palladium of popular liberties, Magna Carta has a constitutional importance that cannot easily be overemphasized. It did not guarantee trial by jury; the "freemen" to whom it refers were, originally, only the feudal landholders. The chief significance of the Charter lies in its basic principle that the king is under the law, a feudal principle which became and remains a foundation of the British constitution. A. H. S.

MAGNESITE, a white earthy mineral when massive, often brown or black when crystallized, due to organic impurities. It is magnesium carbonate, crystallizing in the HEXAGONAL SYSTEM. Magnesite is found massive in DOLOMITE and as veins in serpentine. Refractory bricks for furnace linings are made of magnesite, as are some cements, paints, chemicals and Epsom salts. Important producers are Austria, Greece and the States of California and Washington.

MAGNESIUM, a silvery white metallic element, symbol Mg, atomic weight 24.32, specific gravity 1.74, the lightest metal having sufficient stability for structural purposes. Magnesium in combined form is the eighth most abundant element in the earth's crust.

Manufacture and Uses. Magnesium is manufactured by electrolyzing a fused salt bath containing magnesium chloride at red heat. The metal floats on the molten bath from which it is ladled out and cast into ingots. The metal is produced directly with a purity of 99.8 per cent. The chief use of this metal is in light-weight structural alloys containing 90% or more magnesium. It is also used as a constituent of aluminum alloys; as a deoxidizer for nonferrous metals, chiefly nickel; in powdered or ribbon form for flashlights, FIREWORKS and for military purposes in illuminating rockets and tracers. E. C. B.

Compounds of magnesium find a wide application in medicine: *Magnesium carbonate* ($MgCO_3$) is useful in combating the acidity in the stomach and as a dusting powder and cosmetic. *Magnesium oxide* (MgO) is employed as an antacid to neutralize excessive acidity in the gastric juices, and at times as an effective antidote to corrosive acids. *Magnesium sulphate* ($MgSO_4 \cdot 7H_2O$), popularly known as EPSOM SALTS, is an active cathartic, due to the fact that much of it remains unabsorbed in the intestines where it retains fluid, thus liquefying the stools. *Magnesium citrate,* generally used in the form of an effervescent solution, acts in the same manner as magnesium sulphate. Widely advertised to the public are various brands of suspension of *magnesium hydroxide* in water—Magnesium Magna or Milk of Magnesia—which is used as a mild alkaline laxative or to neutralize excessive gastric acidity. P. N. L.

Metallurgy. Magnesium is industry's lightest and one of its newest structural metals. Although some of its compounds have been known for over 300 years, the metal itself was not produced until 1830, and only recently has it attained commercial impor-

tance. Magnesium does not occur free in nature but its compounds are widely distributed throughout the earth's crust. It is the eighth most abundant element and third most abundant metal. It is now made by the electrolysis of molten anhydrous magnesium chloride, chiefly in the United States and Germany.

The outstanding engineering property of magnesium is its lightness. Additions of small amounts of other metals do not appreciably affect this lightness, but do improve other properties. Although magnesium forms alloys with most of the common metals excepting certain members of the iron and chromium groups, present commercial alloys are limited to three types; (1) magnesium containing 4-10% aluminum and 0.1-0.4% manganese, (2) magnesium containing 1-2% magnesium, (3) magnesium containing about 4% copper with smaller amounts of aluminum, cadmium, and manganese.

Magnesium Alloys. The first class of alloys is used for most cast and wrought parts demanding high strength; the second class for parts requiring maximum corrosion resistance, particularly to salt air and water; and the third class for parts where high thermal properties are important. The magnesium alloys used abroad are, in general, similar to our domestic compositions except that zinc is often present, a practice that has not met with favor in America.

Alloys containing low percentages of added metals are best adapted for mechanically worked parts such as forgings, profile sections, and sheets. Casting alloys usually contain larger amounts of added metals since better physical and mechanical properties are thereby obtained. Alloys containing more than 6% aluminum are susceptible to various heat treatments. Solution heat treatment (SHT) increases the strength, toughness, and malleability of such alloys while a subsequent precipitation heat treatment (SPHT) gives still greater strength, raises the yield point, and decreases the malleability. The properties of typical compositions are given in the following table.

PROPERTIES OF MAGNESIUM ALLOYS

Property	*Cast Mg, 6 Al, 0.3Mn*	*Cast SHT Mg, 8 Al, 0.2Mn*	*Cast SPHT Mg, 10 Al, 0.1Mn*	*Extruded Mg, 6 Al, 0.3Mn*
Tensile strength, lb. sq. in.	28–31,000	31–35,000	33–38,000	40–44,000
Yield point, lb. sq. in.	7–8,000	8–10,000	17–20,000	28–32,000
Elongation, in ins., per cent	9–12	9–12	1–3	10–15
Compressive strength, lb. sq. in.	40–42,000	42–45,000	47–51,000	58–62,000
Brinell hardness	46–50	48–52	70–80	50–55

Magnesium alloys are readily hot worked and can be cold worked to a limited extent. Forging, rolling, and similar operations are usually performed at temperatures between 400° and 900° F. Structural parts can be assembled by acetylene gas welding, electric spot and seam welding, and by riveting. All magnesium alloys are characterized by their ease of machining. The absence of any tearing or dragging tendency permits the use of high speeds and heavy cuts.

The commercial utilization of magnesium alloys is rapidly expanding in those fields demanding extreme lightness. The automotive and aircraft branches of the transportation industry now use appreciable quantities of cast and wrought alloys for crankcases, housings, wheels, fuel tanks, sheet coverings, and furniture. These alloys are likewise finding application in reciprocating parts of machinery and in portable equipment. The developments of the past few years coupled with the enormous supplies of raw material, clearly indicate the unlimited potential possibilities of the magnesium industry. *See also* METALS, LIGHT. J. A. G.

MAGNESIUM SULPHATE: As a purgative. *See* EPSOM SALT; CATHARTICS.

MAGNETIC ANALYSIS, a comparatively new and rapidly developing field for testing various physical properties of metal and metal objects by magnetic means. Among some of these properties may be mentioned hardness, uniformity of structure, fitness for various structural uses, freedom from flaws, segregations and carbon content. The advantage of such tests is that no physical harm is done to the specimen tested. It has been applied to gun barrels, steel balls and ball races, springs, railroad rails and numerous other articles. *See also* MAGNETISM.

MAGNETIC CONCENTRATION, the separation of magnetic ORES from GANGUE by magnetic attraction. Magnetic processes are also used for separating tungsten from tin ore, and chromite from other heavy minerals. The concentrating machine utilizes strong magnets so arranged that the magnetic material will be discharged at one place and the nonmagnetic at another. *See also* ORE TREATMENT.

MAGNETIC DECLINATION. *See* DECLINATION, MAGNETIC.

MAGNETIC DIP, the angle which the needle of a DIP CIRCLE makes with the horizontal at the point where the dip circle is set up. The direction of the earth's magnetic field (*see* TERRESTRIAL MAGNETISM) makes different angles with the horizontal at different points on the surface of the earth. This angle is called magnetic dip, magnetic inclination, or dip.

MAGNETIC FLUX. *See* MAGNETIC INDUCTION.

MAGNETIC HYSTERESIS. *See* MAGNETIC INDUCTION.

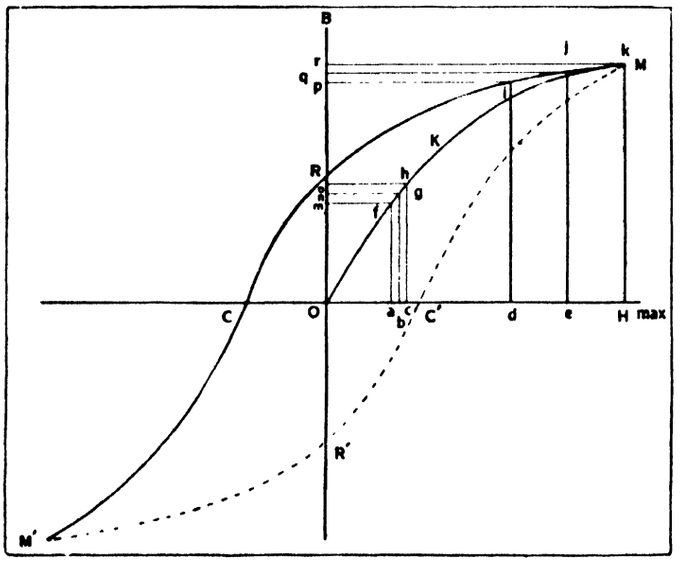
MAGNETIC INCLINATION. *See* MAGNETIC DIP.

MAGNETIC INDUCTION. If a portion of any substance is brought into a magnetic field, the magnetic lines of force (*see* MAGNETISM) will be affected by its presence. If the lines of force seem to avoid the body and pass out around it rather than through it, the substance is *diamagnetic.* If the lines of force seem to pass through the body more readily than they

do through air the substance is said to be *paramagnetic*. The number of lines of force threading through a square centimeter in air normal to the lines is a measure of the *magnetizing force*. It is usual to designate this number by the letter, H. The number of lines per square centimeter is equal to the force expressed in DYNES which the field exerts upon a unit magnetic pole at that particular point. After a substance has been placed in the magnetic field, the number of lines of force per square centimeter will be changed. The number of lines of force is now called the *magnetic induction* or *magnetic flux*. It is usually represented by the letter, B. The ratio of B to H is called the factor of permeability, and is usually represented by μ. It is a measure of the ease with which the magnetic lines of force permeate the substance.

For those substances in which μ is less than unity, the body is less permeable to the magnetic line of force than is air or a vacuum. In diamagnetic bodies, μ is less than unity. In paramagnetic bodies, μ is greater than unity. For the most part μ remains fairly constant as H is varied. In a few substances, however, like iron, nickel, cobalt, manganese and their alloys, μ is greater than unity and varies very markedly with H. These substances are called *ferromagnetic* bodies. They are a special class of paramagnetic bodies.

A diamagnetic body distinguishes itself, when free to move, by migrating from a point of high field intensity to one of low. For this reason, an elongated piece of a diamagnetic substance will set its greatest length normal to a magnetic field when it is freely suspended. All paramagnetic and ferromagnetic bodies tend to turn with their greatest lengths parallel to the field and to migrate from points where the intensity is less to those where it is greater.



NORMAL INDUCTION CURVE, *OKM*, AND HYSTERESIS LOOP, *MRCM'R'C'M*

When a rod of iron, for example, is introduced into a SOLENOID and the current flowing in the solenoid is increased, the field, H, in the solenoid increases in proportion to the current, but the magnetic induction, B, increases as indicated in the curve OKM (see figure). This curve is called a normal curve of magnetic induction. It shows that the introduction of the iron has increased the magnetic field in the solenoid tremendously. This combination of a solenoid and a substance in which B/H is greater than unity affords an important means of obtaining strong magnetic fields.

After a piece of iron has been magnetized to the saturation point, as at point M, the induction will not return along the curve, OKM, as the magnetizing force is decreased but reduces along the curve, MR. When $H = O$, there is still a certain magnetic flux through the iron. It retains a definite amount of magnetism indicated by the ordinate, OR. This property of a substance to hold magnetism after the magnetizing force is removed is called the *retentivity* of the body.

By applying a magnetizing force, H, in the opposite direction, the magnetic flux, B, may be reduced to zero. To do this requires a field, $-H$, equal to OC. The amount of this magnetizing force is called the *coercive force*. It measures the coercivity of the body.

By carrying the magnetizing force in the negative direction as far as it was in the positive and then retracing the process, the relation between the magnetic induction and the magnetizing force will be given by the curve MRCM'R'C'M. It will be noted that the magnetic induction lags behind the magnetizing force no matter which way it is being applied. This lagging is called the magnetic *hysteresis* of the iron, and the cyclic curve MRCM'R'C'M is called the *hysteresis loop*. This loop is important because it gives a measure of the adaptability of the substances studied for various magnetic purposes. If the loop has a very small area and large values of B for small values of H, it indicates a substance that could be used for transformers or for the poles of motors and generators.

Another relation may be worked out for B and H which involves a third important property of a substance, called the *intensity of magnetization*. When a bar of iron is introduced into a magnetic field, the increased magnetic flux in the iron develops magnetic poles at the ends of the bar. These poles are due to the excess of magnetic lines in iron over those in air. Gauss showed that the lines of force radiating from a magnetic pole of strength, m, is $4\pi m$. Hence, if we indicate the excess of B over H by the expression, $B-H$, we can equate it to this polarity which has been developed, viz., $B - H = 4\pi I$, where I is the *intensity of magnetization* or the pole strength per unit area of the iron bar. Inasmuch as $B/H = \mu$ the above equation may be written, $\mu - 1 = 4\pi K$ or $\mu = 1 + 4\pi K$, where K is $\frac{I}{H}$ or the *magnetic susceptibility*. The factor, K, is a measure of the magnetizing effect of a magnetic field on the material placed in the field. S. R. W.

MAGNETIC LINES OF FORCE. *See* MAGNETS.

MAGNETIC POLES. *See* MAGNETISM; DECLINATION, MAGNETIC.

MAGNETIC STORMS. *See* TERRESTRIAL MAGNETISM.

MAGNETIC UNITS. Magnetic *field intensity* (*see* MAGNETIC INDUCTION) is the force in DYNES with which a magnetic field acts upon a unit magnetic pole. A unit field exists when it pushes or pulls a unit magnetic pole with a force of one dyne. This unit is called the *gauss*. It is the magnetic flux per unit area. If ϕ is the total flux, then $\phi/A = H$, where A is the area through which the flux passes and H is the magnetic flux per unit area, or the field intensity, when the medium is air, whose permeability is unity. If the medium in which the total magnetic flux, ϕ, exists has a permeability, μ, other than unity, then,

$$\phi/A = \mu H = B$$

where B is the magnetic induction, or the flux per unit area in the medium. Both H and B are measured in terms of gausses and may be thought of as the flux density.

When the number of lines of force linked with a conductor is made to vary in such a way that the total change per second induces an absolute unit of potential difference (*see* INDUCTION COIL), the number of the magnetic lines of force cut per second is called a *maxwell* of flux. The volt is equal to 10^8 absolute units of potential difference. In order to produce a potential difference of one volt, 10^8 maxwells of magnetic flux must be cut per second. This flux is sometimes called a *weber* of flux.

There is a law for the magnetic flux known as Bosanquet's Law which states that

$$\textit{magnetic flux} = \frac{\textit{magnetomotive force}}{\textit{reluctance}}.$$

This is analogous to Ohm's Law (*see* RESISTANCE). Bosanquet's Law also becomes a defining equation for magnetic units. The unit of the magnetomotive force is the *gilbert*. It represents the work done in carrying a unit magnetic pole around the magnetic circuit. In the case of a SOLENOID, if a unit magnetic pole is moved through the solenoid and out through space back to the other end again, a certain amount of work is done. If the current flowing in the solenoid is measured in amperes, then the magnetomotive force in gilberts is given by the equation,

$$m.m.f. = 0.4\,\pi\,NI,$$

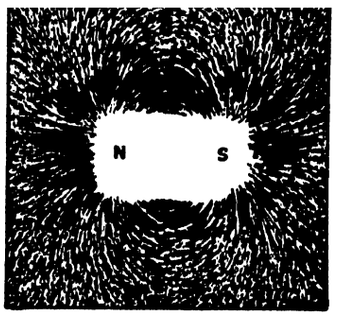
where N is the total number of turns in the solenoid and I is the current in amperes. The gilbert is the magnetomotive force produced by a current of $10/4\pi$ amperes flowing in a single turn of wire. The product of NI is called the *ampere-turns* and this is taken by engineers as a measure of the magnetomotive force. A magnetomotive force expressed in gilberts may be reduced to the equivalent number of ampere-turns by dividing by $4\pi/10$.

The unit of *reluctance* is defined as the reluctance of a magnetic circuit which requires a magnetomotive force of one gilbert to establish a flux of one maxwell. It is called the *oersted*. Thus, Bosanquet's Law may be written, $\text{oersteds} = \frac{\text{gilberts}}{\text{maxwells}}$.

S. R. W.

MAGNETISM, that agent which a body possesses whereby it is enabled to attract small pieces of iron. At least 600 years B.C. it was known that LODESTONE (MAGNETITE) possessed that power of attraction.

In 1820, Oersted showed that when an electric current flowed in a wire a magnetic field was set up about the wire, and that this field had the same properties as the magnetic field about the lodestone. In Oersted's discovery it is seen that ELECTRICITY in motion produces a magnetic field, and the theory is that all magnetic fields are due to electricity in motion. In the case of the lodestone, the ATOMS composing a lodestone are thought of as a planetary system in which ELECTRONS are revolving about the central nuclei of the atoms and that the moving charges give rise to the magnetic forces present. It is assumed that all of the atomic planetary systems are so turned that their magnetic fields unite to form the resultant field of the lodestone. This means that the axes of revolution of the electrons are all turned in a similar direction and remain fixed in that position. If a piece of hard steel is stroked by a piece of lodestone, the steel will acquire the same properties as the lodestone. A steel bar may also be magnetized by placing it in a very powerful magnetic field. In this process it is assumed that the atomic or elementary magnets are all made to point more or less in the same direction. Steel that has been properly heat treated will retain this condition for a long time, and this power of retaining magnetic qualities is spoken of as *retentivity*. The accompanying figure shows a lodestone about which iron filings have been scattered. A similar picture would be obtained if iron filings were scattered about a piece of steel which had been magnetized. It will be noted that the iron filings arrange themselves along certain paths, called *lines of force*. These are the paths along which the magnetic force acts. There are two points toward which these lines of force seem to converge. These points are called the *magnetic poles,* and the lodestone, or the magnetized piece of steel, is called a *magnet*. One end of a freely suspended magnet will turn toward the north. This end is called the positive, or north-seeking, pole, while the other is called the negative, or south-seeking, pole.



MAGNETIC FIELD ABOUT A LODESTONE

Like magnetic poles repel and unlike poles attract each other. This means that what is called the north magnetic pole of the earth is a negative, or south-seeking, pole. Coulomb showed the magnetic poles exert a force on each other which is proportional directly to the product of the pole strengths and inversely to the square of the distance between them, or

$$F = \frac{m_1 m_2}{\mu d^2}.$$

where μ is a factor of proportionality which is unity for air, m_1 and m_2 pole strengths and d the distance between poles. This equation enables a unit magnetic pole to be defined. Such a pole is one which, situated at a distance of one centimeter from a similar pole in air, exerts a force of one DYNE upon it.

The magnetic field of a lodestone, or of a conductor carrying an electric current, has both magnitude and direction. The magnitude of the field is defined as the force which the field would exert on a unit magnetic pole, were it placed at the point where the field strength is desired to be known. The direction of the field is defined as the direction in which a positive magnetic pole would move in the field if allowed to move freely. *See* MAGNETIC UNITS. S. R. W.

MAGNETITE, a naturally occurring oxide of iron which is attracted by a magnet, and is capable itself of becoming a magnet, when it is called LODESTONE. It is an ORE of iron. Magnetite is black and almost metallic in appearance, usually found as grains or isometric (octahedral) crystals, or in solid masses, in gneisses, granites and metamorphic limestones. Molten intrusions of IGNEOUS ROCKS are the source. It weathers to LIMONITE. One of the largest high-grade ore bodies in the world is the magnetite body at Kiruna, Sweden. It is also mined in New York and New Jersey, and occurs in western United States. *See also* ORE DEPOSITS; ISOMETRIC SYSTEM; METAMORPHISM; ADAMANT; ACCESSORY MINERALS.

MAGNETO, HIGH TENSION, an alternating-current generator (*see* ELECTRIC GENERATOR) whose ARMATURE rotates in the magnetic field of permanent MAGNETS. In a simple magneto, the armature consists of a single coil of many turns wound on an iron core. The so-called high-tension magneto has two coils wound on the same armature. One, the secondary coil, from which the current is taken, consists of many turns and is wound over the other, or primary coil, which is of comparatively few turns. The primary coil is short-circuited by an auxiliary device and therefore has a strong current generated in it. This current contributes to the magnetization (*see* MAGNETISM) of the armature core. The auxiliary device breaks the circuit of the primary coil at the instant the generated electromotive forces in the two coils have their maximum values. The magnetic flux, due to the change in the magnetization of the core and to the eliminated current, collapses, and, in cutting the secondary coil, it induces an electromotive force which is superposed on that being generated in that coil by the rotation of the armature. Such magnetos have electromotive forces as high as 18,000 volts, and they are generally employed for producing the ignition spark in INTERNAL-COMBUSTION ENGINES. A. Z.

MAGNETO-ACOUSTICS, a field of science which covers all of those magnetic phenomena in which MAGNETISM gives rise to SOUND vibrations or to variations in the intensity, quality or frequency of sound. It also includes those phenomena in which mechanical vibrations, such as sound, influence magnetic properties.

Illustrations of the first kind may be seen in the way a magnetic field varies the frequency of the longitudinal vibrations of a rod or the frequency of a TUNING FORK. The second class may be used to affect the magnetic quality of steel, as e.g., the reduction of the residual magnetism of an iron bar.

MAGNETO-ELECTRICS. In an attempt to introduce a uniformity of terms in magnetic phenomena, the expression "magneto-electrics" is used to correspond to such terms as magneto-acoustics, magneto-optics, magneto-magnetics, magneto-mechanics and magneto-thermics. It covers practically the same field as ELECTROMAGNETISM, with perhaps a wider range of phenomena, if there is any difference. For instance, an electric conductor has its resistance changed by a magnetic field. This is a magneto-electric phenomenon.

If an electric current flows through a metal plate normal to a magnetic field (*see* MAGNETISM), an electromotive force will be set up normal to the field and to the lines of electric flow. The same thing happens with the flow of heat. A magnetic field changes the electromotive force of a THERMOCOUPLE and of a cell; in fact, it has an influence on all electromotive forces. All such phenomena come under the science of magneto-electrics. S. R. W.

MAGNETOGRAPH. *See* TERRESTRIAL MAGNETISM; MAGNETOMETER.

MAGNETO-MAGNETICS, a field of science covering those phenomena in which a magnetic field calls forth the magnetic characteristics of a substance. *See also* MAGNETIC INDUCTION; MAGNETISM.

MAGNETO-MECHANICS, a field of science covering those magnetic phenomena in which a magnetic field produces mechanical effects. For instance, if a rod of iron is magnetized longitudinally, it will change its length by increasing it for weak fields and decreasing it for strong. Nickel rods shorten for all field strengths. Some alloys of manganese lengthen for all fields, while cobalt, under special conditions, first shortens for weak fields and lengthens for strong. This behavior of cobalt is just the reverse of that for iron. In all of the above cases, if a transverse field is applied instead of a longitudinal one, nearly the reverse effect occurs. These phenomena are known as the *Joule magnetostrictive effects.*

Wiedemann discovered that if an electric current flows through a rod, magnetizing it circularly, and at the same time the rod is magnetized longitudinally, the combined circular and longitudinal fields produce a twist in the rod. It is really a special case of the Joule effect, as changes in length take place along the resultant field which is directed along a helix in the rod. Conversely, if a rod is magnetized longitudinally and given a mechanical twist, it becomes magnetized circularly. If magnetized circularly and twisted mechanically, it becomes magnetized longitudinally. Changes in volume also occur under a magnetic field. S. R. W.

MAGNETOMETER, a magnetic needle, mounted so that it may move either about a vertical or horizon-

tal axis, or both. A COMPASS and an inclinometer (*see* DIP CIRCLE) come under this designation. The name is given more specifically to a magnetic needle which is suspended by a fine vertical fiber, so that the needle will swing about an axis normal to its magnetic axis. The needle may have the shape of a bar, a horseshoe or a bell. The latter has a number of factors to commend it. The deflections of the magnetometer are read by means of an attached mirror which reflects a beam of light onto a scale or into a TELESCOPE. The magnetometer is a very useful tool for observing magnetic field intensities and their variations. *See also* MAGNET; MAGNETISM.

MAGNETOMETRIC EXPLORATION. *See* EXPLORATION, MAGNETOMETRIC; GEOPHYSICS.

MAGNETON, unit of magnetism, corresponding to the ELECTRON in electricity. An idea of the magneton may be obtained in the following way: The magnetic poles of a magnet cannot be separated. If one breaks a magnet in two, two magnets will be produced. Instead of holding a positive pole in one hand and a negative pole in the other, one holds a complete magnet in each hand. Each piece may again be broken in two, and again the breaking of each magnet produces two. If one imagines this process going on indefinitely, there comes eventually a piece of the material, which on breaking in two, does not form two magnets. That ultimate little magnet may be called the magneton. This little magnet has had its magnetic moment determined, but it has not been isolated in the sense that the electron has. Bohr found the value of the magnet moment of the elementary magnet to be $M = 9.2 \times 10^{-21}$ electromagnetic units.

MAGNETO-OPTICS, a science concerned with the effects of magnetism upon light. Faraday searched a long while for the effect of a magnetic field on a source of LIGHT. He did not find it because his instruments were not sensitive enough. He did discover, however, that if polarized light (*see* POLARIZATION OF LIGHT), is passed through a block of glass magnetized in the direction in which the light is going, the plane of polarization is rotated. This is known as the *Faraday Effect.*

Kerr discovered that polarized light, when reflected from the surface of a magnetized reflector, undergoes a change due to the magnetic field. This is known as the *Kerr Magnetic Effect.*

If a SODIUM flame is placed between the poles of a powerful ELECTROMAGNET, and the light examined by a SPECTROSCOPE of high resolving power, it will be seen that the original lines of the sodium spectrum have been transformed into doublets when looking normally across the magnetic field. This is the *Zeemann Effect* and the one for which Faraday sought in vain. These are some of the important magneto-optical effects. S. R. W.

MAGNETO-THERMICS, a science concerned with the effects of magnetism upon heat, and vice versa. MAGNETISM produces HEAT effects. Repeated reversals of a magnetic field in a piece of iron raise its temperature. If heat is flowing along a metal plate, a magnetic field applied normal to the plate and to the direction of flow of the heat, will affect the heat gradient in the plate both longitudinally and transversely. Conversely heat has a profound effect on magnetic phenomena. All of these phenomena come under the heading of magneto-thermics.

MAGNETRON OSCILLATOR, a two-element electronic tube (*see* TUBES, ELECTRONIC) having a cylindrical plate and a straight filament placed at the axis of the cylinder. If an external magnetic field (*see* MAGNETISM) is placed with its direction parallel to the axis of the cylinder, an ELECTRON leaving the filament will find itself in a field of force due to its own motion through the magnetic field. It will then follow a more or less spiral path about the filament. For some critical value of the magnetic field it will just fail to reach the plate. Under these conditions, a space charge of electrons may build up both near the filament and near the plate. These charges will soon begin to disperse. Then the whole process will repeat itself. During this phenomenon, high-frequency currents may be detected in the external circuits of the tube. Frequencies corresponding to WAVE-LENGTHS of 2.8 cm. have been reported by Kinjiro Okabe of Japan. L. G. H.

MAGNETS. It was known in 600 B.C. that certain rocks possessed the property of attracting small pieces of iron. A piece of rock which possessed this property was called a lodestone, or leading stone, because it had directive powers. Because this stone was first found, as Lucretius says, "in the native hills of the Magnesians" it came to be known as the Magnesian stone or as a magnet.

A lodestone is a natural magnet. A piece of steel which has acquired the property of attracting small pieces of iron to it as does the lodestone, is an artificial magnet. There are two fairly distinct points, one at each end of a magnet, called the *poles.* They are the points towards which the magnetic forces are concentrated. The paths over which the forces of a magnet act are *magnetic lines of force.* They are always closed lines of force. In the case of a magnet, it is conventional to represent the lines of force as passing through the magnet from the south, or negative, pole to the north, or positive, pole and then continuing out through space and around again to the south pole.

Any magnet, whether artificial or natural, will set itself parallel to the earth's field if free to move. COMPASS needles, therefore, are nothing but freely suspended magnets. The best artificial magnets are made from special steels and given special heat treatments to insure the highest retentivity possible. It is remarkable how constant the magnetic qualities of a good magnet remain. *See also* MAGNETISM; TERRESTRIAL MAGNETISM. S. R. W.

MAGNIFICAT, the hymn of praise of the Virgin (Luke 1:46-55), used since the 6th century in the vesper service of the Catholic Church and for many centuries in the evening prayer of the Anglican Church. It has had innumerable musical settings by

medieval and modern composers. The title is taken from the opening words, *Magnificat anima mea Dominum,* "My soul doth magnify the Lord."

MAGNIFYING POWER, the number which indicates the ratio between the apparent diameter of an object as seen through a telescope to that seen without. High magnifying power seems to bring the object nearer.

MAGNITOGORSK, a town which in 1931-32 was under construction in the southern Urals, situated about 155 mi. southwest of Cheliabinsk. It rests at the foot of Magnitnaya or Magnet Mountain on the banks of the Ural River, in rolling steppe country. The town, which in 1933 was expected to shelter more than 10,000 families, was to be the site of the Magnitogorsk steel mill, planned as the largest in Europe and one of the largest in the world. The cost of the mill, homes, power plant and railroad undertakings has been estimated at $350,000,000. Completion of construction was expected by Jan. 1, 1933. The annual production output has been set at 2,600,000 tons of pig iron and 2,100,000 tons of rolled steel. Coking coal is to be brought from the Kuznetz basin in Siberia, but coal deposits discovered in 1930 within 200 mi. of the site of Magnitogorsk were expected to provide a nearer source of supply of anthracite. The source of raw material is the high-quality and almost inexhaustible iron ore occurring in the adjacent mountain. American engineers have served as technical consultants in the construction of the mill.

MAGNITUDE, in astronomy, is used to indicate the brightness of the stars. In the first star-catalogue made, that of Ptolemy in 127 A.D., the stars were arranged in six classes, those of the first magnitude comprising the twenty or so brightest stars, those of the sixth magnitude the stars just visible to the unaided eye. More precise observations have shown that the difference of five magnitudes corresponds very closely to a light ratio of 100.

Since it appears to be a human faculty to record as a light difference what is actually a ratio, the modern scale of magnitudes has been established in such a way that a difference of five magnitudes corresponds exactly to a ratio of 1 to 100, or a difference of one magnitude to a ratio of 2.512 in light. Such a scale not only permits an indefinite extension toward brighter and fainter objects, but also allows of more precise classification by the use of decimals. Thus, stars of the eleventh magnitude, being 5 magnitudes different and 100 times fainter than stars of the 6th magnitude, are 10,000 times fainter than stars of the first magnitude; stars of the sixteenth magnitude are 100 times fainter still.

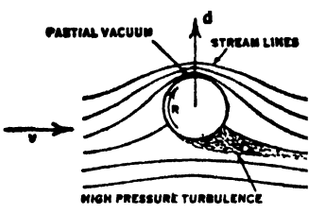
Furthermore, stars brighter than those of the first magnitude must be represented by negative numbers, hence it has been found necessary to represent the brightness of Sirius by giving it the magnitude —1.58. This indicates that Sirius is a little more than 10 times brighter than the average first magnitude star of magnitude 1.00. On this same scale the magnitude of the full moon is about —12, that of the sun —27, while the faintest stars visible through the largest telescope are approximately of magnitude 21. W. J. L.

MAGNOLIA, a genus of beautiful trees and shrubs of the magnolia family embracing many highly prized ornamentals. There are about 30 species found chiefly in eastern North America and eastern and southern Asia; seven species, with several varieties, are native to the southeastern United States. They are mostly medium-sized trees with aromatic bark; long, leathery, deciduous or evergreen leaves, and large, handsome, fragrant flowers ranging in color from white to pink, purple and yellow. The brownish-red conelike fruit bears numerous, usually scarlet seeds, which, when ripe, hang suspended for a time on long thin cords. Among the best known native species are the laurel magnolia or SWEET BAY (*M. virginiana*); the CUCUMBER TREE (*M. acuminata*); the large-leaved magnolia (*M. macrophylla*), with leaves 2 ft. long and flowers a foot across; the UMBRELLA TREE (*M. tripetala*), and the evergreen magnolia (*M. grandiflora*), sometimes 135 ft. high, adopted as the state flower by Louisiana and Mississippi. Several Asiatic species, with numerous varieties and hybrids bearing a profusion of flowers before the leaves appear, are favorite garden ornamentals.



LAUREL MAGNOLIA OR SWEET BAY
Stamen (upper left), cone of fruit, the seeds hanging as they drop, and flower

MAGNUS EFFECT, a phrase denoting the result of the forces acting on an object, as, e.g., a cylinder or sphere, when it is rotated in a moving stream of gas. It is the cause of the "curve" in the path of a pitched baseball, as well as the sidewise "drift" of a projectile. *See also* BALLISTICS, EXTERIOR. The effect may be explained in the following fashion: The "skin" friction between an object and the surrounding atmosphere is greater in amount than the *interior* friction of that atmosphere, and because of this difference a rotating object will tend to "pile up" or compress the gas on that side that is turning against or into the stream, and to rarefy the



FORCE DIAGRAM SHOWING MAGNUS EFFECT ON A ROTATING CYLINDER

gas on that side that is moving in the same direction as the stream. This is readily understood from an examination of the accompanying figure. The result is that a force is exerted on the object tending to move it away from the side upon which the pressure is greatest, or at right angles to the direction of the stream of gas. *See also* FLETTNER MOTOR.

MAGOG, an industrial town of Stanstead Co., Quebec, Canada, situated at the northern extremity of Lake Memphremagog at its outlet through the Magog River, about 79 mi. southeast of Montreal. With the largest textile factory in Canada, Magog also contains saw, grist, and cotton mills, and butter and cheese factories. A pleasant town, it is the site of a government fish hatchery and affords excellent fishing facilities. Pop. 1921, 5,159; 1931, 6,302.

MAGPIE, a genus (*Pica*) of handsome non-migratory birds allied to the crows and jays. There are several species widely distributed in north temperate regions. In size and structure magpies resemble small crows, but otherwise they are more nearly like the jays. A striking characteristic of magpies is the remarkable long graduated tail, sometimes longer than the head and body combined.

The common magpie of the Old World (*Pica pica*), found widely in Europe and Asia, is about 18 in. in length, of which the longest tail feathers sometimes measure 11 inches. The male, with glossy black plumage varied with a bronzy iridescence except for a white belly and white wing patches, is one of the most striking of European birds. Magpies construct, generally in trees, very bulky domed nests with two entrances, laying five to nine usually bluish-green eggs blotched with purplish brown. An omnivorous feeder, the magpie devours fruits, seeds, snails, small mammals and the eggs and young of other birds. It is very active, bright and saucy in habit, easily tamed, and may occasionally be taught to articulate a few words. Like the crow, it is often an annoying pet because of its thievish propensities. Magpies usually consort in pairs and display remarkable cleverness in hunting their food. When alone, they are usually silent, but when in small flocks they become noisy, uttering loud harsh cries.

The American magpie (*P. p. hudsonia*), found in western United States and Canada, is a variety of the European species, but the only American species, the yellow-billed magpie (*P. nuttalli*) of California is quite distinct. A. B. J.

MAGPIE, AMERICAN, called also black-billed magpie (*Pica pica hudsonia*), very similar to the European magpie, is found from Hudson Bay southward to Nebraska and New Mexico and westward to Alaska and the eastern slopes of the Sierra Nevada and Cascade mountains. The yellow-billed magpie (*P. nuttalli*), a smaller species, occurs in California.

MAGYAR LITERATURE, the literature of the Magyars or Hungarians, which is treated under the title HUNGARIAN LITERATURE.

MAGYARS, the name by which the Hungarians call themselves. In origin and language they belong, together with the Finns, Lapps, Esthonians and Livonians, to the Finno-Ugrian branch of the Ural-Altaic family. Medieval writers called them Wengri, Ugri, Urigri, Ungair and Hungaic. Little is known of their early wanderings until they entered Hungary over 1,000 years ago, and conquered the Slavs whom they found there. They were restless nomads who for half a century terrorized their neighbors, the Moravians, and repeatedly made devastating raids into Germany and Italy. After being defeated by Henry the Fowler in 933, and by Otto the Great in 955, they began to adapt themselves to a more settled existence and to assimilate civilizing influences, especially western political institutions. Christianity was also taking root and under St. Stephen (977-1038) replaced heathen superstitions.

Whatever their vicissitudes, either as an independent monarchy conquered by the Turks, or subjects of the Habsburgs, the Magyars never failed to retain their race consciousness. This they owed doubtless to their intelligence, military spirit, homogeneity and fine location on the rich Danubian plain. In spite of the large number of other racial elements in their country, including Slavs, Rumanians, Germans, Jews and gypsies, the Magyars remained the ruling class, and for the most part, the land owners, though at the time of the war they numbered only about half the population. The official language of the kingdom of Hungary was Magyar, and its official name Magyaronsay, or country of the Magyars.

The Magyars make up about 90% of the population of Hungary as constituted by the Treaty of Trianon in 1920, while some 30% of their race are included in territory ceded to others. The fact that some of the districts lost to her neighbors contain Magyar majorities has been a source of acute discontent in the new post-war state. A. L. L.

MAHALALEEL, according to the BOOK OF GENESIS (5:12), the son of Kenan and the great-grandson of SETH. He is also called Mehujael (4:18), while the *Book of Jubilees* makes it Malalel. Some modern scholars hold that it is but another form of Methuselah, with whom they identify him. Others say his name is heroic in origin, a Hebraised form of the common Babylonian divine name. Apart from the Oriental legend that he was the first miner in search of metals, his name is the only clue to his history.

MAHAN, ADMIRAL ALFRED THAYER (1840-1914), Rear-Admiral and historian, was born at West Point, N. Y., Sept. 27, 1840. He became a midshipman at 19 and lieutenant at 21, rising steadily in the service till he was made captain in 1885. In 1896 he was retired at his own request to become president of the United States Naval War College and professor of history and strategy. He was a member of the Naval War Board in the SPANISH-AMERICAN WAR (1898), and a delegate to the Hague Peace Conference in 1899. In 1902-1903 he was president of the American Historical Association, and in June 1906 was advanced to the rank of rear-admiral.

Mahan's work as a historian is of first-rate importance. It presents an interpretation of international relations and war from a new point of view, proceeding from the thesis that sea power proved the decisive factor in the wars of modern Europe, especially of the French Revolution and of NAPOLEON. His conclusions, based, not only on an intimate knowledge of naval matters, but equally, upon sound historical scholarship, have been generally accepted. As such they have exercised great influence not only in the writing of maritime history but also upon the actual policies of all maritime powers. His best known works are: *Influence of Sea Power upon History, 1660-1783,* 1890; *Influence of Sea Power upon the French Revolution and Empire, 1793-1814,* 2 v. 1893 (repeated editions since), *Sea Power in its Relation to the War of 1812,* 2 v. 1905; and *Life of Nelson,* 1877. Admiral Mahan died Dec. 1, 1914. W. E. Li.

MAHANOY CITY, a borough of Schuylkill Co. in eastern central Pennsylvania. It is situated about 10 mi. northeast of Pottsville. Two railroads and buses afford transportation. The principal industry is coal mining. In 1929 the total manufactures amounted approximately to $2,000,000, among which shirts were important products. In the same year the retail trade amounted to $5,109,540. Mahanoy City was incorporated as a borough in 1863. Pop. 1920, 15,599; 1930, 14,784.

MAHDI, or al-mahdi, "the one guided" by Allah, that is, the name taken by or given to many rulers and leaders of Islam, for example: an Abbasid khalif and father of Harun al-Rashid; a leader (Ibn Tumart) of the Berber Muwahhadin (Almohades; *see* MARABOUTS) who once controlled Spain, and the Nubian who was driven from Khartum by Lord Kitchener in 1898. The name is especially dear to the Shi'i Moslems who hold the notion of a hidden imam who will one day come as al-mahdi to redeem the faithful, although the Sunnis, also, look for such a final intercessor. Moslem tradition holds many references to al-mahdi, a messianic figure. On such ground many ambitious leaders have from time to time announced themselves as "the one guided," for whom mankind is looking. There is some mahdist notion back of BABISM and Bahaism.

MAHICAN, a tribe of the North American Indian Algonkian stock. They occupied the eastern and western banks of the Upper Hudson River in New York, and northward to the vicinity of Lake Champlain. On the east their territory extended to Massachusetts where they held the upper Housatonic Valley. The name has often been loosely applied, but is correctly limited to the group known as MOHEGAN on the lower Connecticut River, and to the group living on the Hudson River. Pressure from the whites forced the Mahican to migrate westward, some going to the Susquehanna River, others to the Munsee and Delaware where they lost their tribal identity. The present Stockbridge are descendants of a Mahican group gathered at a mission in 1736 at Stockbridge, Mass. The Mahican seem to have comprised five subtribes, with chieftainship hereditary in the female line. They lived in communal rectangular and round-roofed houses constructed on a foundation of poles covered with bark, usually in stockaded villages.

MAH JONG, a Chinese game, more than eight centuries old, now known throughout the world. It is intended for four players without partnership, though two to five may play. Originally a card game, each card bearing the name of a revolutionary hero, it is generally played to-day with a set of 148 pieces, called tiles, made of ivory, or bone, backed with bamboo. The three principal suits, characters, circles and bamboos, are numbered from one to nine, and there are four tiles of each number. Honor suits consist of the four winds, four red, green, and white dragons, and four red and green seasons. Players take the names of the winds. The highest thrower of dice becomes East wind; the next South, sitting at East's left; the third West, opposite East, and the fourth North. After the tiles are faced downward on the table and shuffled, a wall, 18 tiles long, in double rows, resembling a hollow square, is built, and from this each player takes 13 tiles by twos; East wind takes 14. The players draw tiles from the wall, one at a time, and the first to dispose of all his tiles by matching groups of three or four like tiles, or sequences in the same suit, calls Mah Jong and wins. He is paid in counters according to the value of his opponents' hands. Players call pung, for three of a kind, chow for a sequence, and kong for four of a kind, when they lay their tiles on the table during the game.

MAHLER, GUSTAV (1860-1911), Bohemian conductor and composer, was born at Kalischt, July 7, 1860. He received his education at Vienna University and studied music at the Vienna Conservatorium under Epstein and BRUCKNER. After conducting opera at Cassel in 1885-1886, at Leipzig in 1888-1891, and at Pesth and Hamburg in 1891-1897, he returned to Vienna where he directed the Court Opera for ten years. In 1907 he visited the United States as guest-conductor at the Metropolitan Opera, New York, and in 1909 became conductor of the New York Philharmonic Orchestra with which he remained two years. As a composer he was inclined to be prolix, but his nine symphonies (his tenth was left uncompleted) are the work of an unquestionable master of orchestration. In addition to his symphonies he composed a large number of songs, and after CARL WEBER's sketches, an opera, *Die drei Pintos.* He died at Vienna, May 18, 1911.

MAHOGANY (*Swietenia Mahagoni*), a large evergreen tree of the mahogany family yielding one of the most valuable cabinet woods. It is native to tropical America, extending southward to Peru and northward to southern Florida; it is cultivated in various warm countries, especially in India. The tree grows usually from 40 to 75 ft. high with a thick trunk, bearing reddish scaly bark, ashlike leaves composed of 4 to 8 leathery leaflets, whitish flowers in axillary clusters and woody, pear-shaped, capsular fruits containing large winged seeds.

The reddish-brown wood, of great hardness and durability, was first introduced into England in 1597 by Sir Walter Raleigh. It did not become an article of commerce, however, until about 1750. While formerly used in shipbuilding, mahogany, because of its rich color and susceptibility to high polish, is now almost exclusively utilized in the manufacture of fine furniture, either solid or in the form of veneer. Various other trees producing wood of somewhat similar quality are called mahogany.

MAHOMET. *See* MOHAMMED.

MAHONIA, a genus of evergreen shrubs of the BARBERRY family several of which are cultivated for their handsome foliage and showy yellow flowers. There are about 50 species, natives of North and Central America and of eastern and southeastern Asia. By some authorities the mahonias are included with the barberries (*Berberis*) from which they differ chiefly in having spineless branches, pinnate leaves and large flower-clusters springing from the axils of the bud-scales.

MAHRATTA CONFEDERACY, a confederation of five states of India—Baroda, Gwalior, Indore, Nagpur and the "dominions of the Peshwar"—which came to an end in 1818. In the reign of Aurangzeb, 1658-1707, there was a gradual rise of the Mahrattas, a Hindu people inhabiting Central India. This despised race of Deccan peasants were welded together as a nation by Sivaji Bhonsla, 1627-80. The descendants of Sivaji in the second generation reigned only as pageant kings, and the real sovereignty passed to their Brahman minister, Balaji Vishvanath, who founded a dynasty seated at Poona. By the middle of the 18th century Mahratta power threatened every settled government in Central India, and it seems certain that but for the British challenge the whole inheritance of the Moguls would have passed into their hands. Four hard fought campaigns were necessary before the Mahratta Confederacy was shattered, subdivided and subdued.

MAHRI, a SEMITIC language of the South ARABIC group, closely connected with Shauri and Sokotri, and spoken in southern Arabia. Peculiarities of this dialect are the retention of all three Proto-Semitic sibilants (elsewhere only in Hebrew), and the feminine pronoun in *s-*, with the masculine in *h-*.

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MAHRISCH-OSTRAU. *See* MORAVSKÁ OSTRAVA.

MAIA, in Greek mythology, daughter of ATLAS and Pleione, was the eldest and most beautiful of the PLEIADES. She was loved by ZEUS, and became the mother of HERMES in a grotto on Mt. Cyllene. The Romans associated Maia with an ancient goddess of spring.

MAIDENHAIR, the general name for a numerous genus (*Adiantum*) of graceful ferns many of which are highly prized greenhouse ornamentals. There are about 200 species, natives chiefly of tropical America, found mostly in shady places; five species occur in the United States. They are usually low perennials with matted rootstocks from which rise black, highly polished stipes bearing delicate leaves divided into fan-shaped leaflets with the outer margins folded over (revolute) covering the spore-bearing bodies (sporanges). The common maidenhair (*A. pedatum*), one of the most beautiful North American woodland ferns, is found from Nova Scotia to Alaska southward to Georgia and California; it occurs also in Asia. The Venushair (*A. Capillus-Veneris*), widely distributed in the warmer parts of the world, grows across the continent from Virginia to California and southward.

MAIDENHAIR TREE, a name given to the GINKGO because of the resemblance of its leaves in form and venation to the leaflets of the maidenhair fern.

MAIDEN LANE, a street in London, between the Strand and Covent Garden, said to have received its name from an image of the Virgin which once stood there. It has many literary and artistic associations, treasuring especially memories of Andrew Marvell, the poet (1620-78), the French writer, Voltaire (1694-1778), and the great English painter, J. M. W. Turner (1775-1851).

MAIDSTONE, the county town of Kent, England, lying 41 mi. southeast of London on the Medway and in a rich agricultural area given over largely to hop-gardening. There are evidences of Roman occupation although the name probably is of Saxon derivation. In the handsome parish church (1395) is a mural tablet to Laurence Washington (d. 1619), a collateral ancestor of GEORGE WASHINGTON, and clustered about it is a group of fine medieval structures. William Hazlitt, the essayist, was born at Maidstone in 1778. The manufacture of wool, introduced by the Walloons in the 16th century, has been superseded by a thriving paper industry, and the principal grain market of the county is held in the town. There are cement and lime factories, and breweries dependent upon the hops cultivated in the neighborhood. Pop. 1921, 37,216; 1931, 42,259.

MAIDU or **PUJUNAN,** a North American Indian tribe which constitutes also a distinct linguistic stock and is one of the larger Northern California stocks. They formerly occupied the valley of the Sacramento to the eastern boundary of the State and from Lassen Peak to the north fork of the Cosumnes River and the Sierra Nevada in California. The various tribal divisions were all called Maidu and were distinguished only by the local village designations. Maidu comprised three dialectic divisions, a northwestern, a northeastern and a southern, which differed in culture as well as language. The westward rush to the gold fields, once the habitat of the Maidu, served to disperse and decimate the tribe which is now scattered near its ancient habitat sites. The Maidu were typical Central Californians. They lived in permanent villages of semiunderground conical bark, grass or earth-covered houses, and depended for food on wild vegetable products, particularly acorns, as well as fish and game. They used both the balsa and dugout canoes for transportation, wore

little clothing and made very fine baskets. Their social organization was simple, the village headed by a chief being the chief unit. The Maidu had many elaborate ceremonies, the main features of which were dances. The most important ceremony was the annual mourning in which sacrifices were made to the dead.

MAIKOP, administrative center of Maikop district, in the North Caucasian Region of the R.S.F.S.R., in southeastern Europe. It is situated in the foothills of the main Caucasian range, on the Belaya River. The city was founded as a fort in 1858. Geological researches in 1900-01 disclosed the presence of oil which led to the development of the petroleum industry. Maikop has also lumber, tobacco and tanning factories. The former grand ducal preserves are now the Caucasian State Warren. The local museum specializes in paleontological material; the vicinity is rich in relics of the copper age. Pop. 1926, 53,028.

MAILLOL, ARISTIDE (1861-), French sculptor, was born at Banyuls-sur-Mer, France, Dec. 25, 1861. He studied with Cabanel at the École des Beaux-Arts. For a time he painted, experimented with wood carving, and designed tapestries. He came under the influence of Gauguin, and turned to sculpture when he was 35 years old. Maillol is held by many to be the leading modern French sculptor of to-day. A female torso, *L'Action Enchainée,* is in the Metropolitan Museum. His monument to Cézanne combines a classic simplicity with the beauty of modern form and is one of the beautiful monuments of the world.

MAIL ORDER BUSINESS, a form of trade practiced by large houses that carry complete and diversified lines of merchandise and get their orders from catalogues which are mailed to former customers or prospects. The mail order business received its greatest encouragement when the U.S. Post Office Department established 4th class mail, i.e., Parcel Post, which took effect on Jan. 1, 1913. It is receiving its greatest discouragement from the advent of the automobile, bringing the opportunity to shop 10 or even 50 miles away in a morning. To meet this latter condition two of the largest mail order houses have established a series of chain stores. In addition to the large catalogue houses, many specialty houses do a mail order business. These specialty houses are most successful when their products are unique and noncompetitive, have a universal appeal and have an ample margin for sales promotion. The mailing list of former customers or prospects is a basic asset; the cash value of names and addresses varying in accordance with the amount of business that can be secured per unit, e.g., per thousand, of names solicited. The principle lies in mass solicitation for percentage of orders. Mail order business has reached a higher standard than formerly. Claims for merchandise are carefully checked to avoid misrepresentation and must comply with postal regulations. This means virtually government supervision, and insures a high degree of integrity. Many department stores have mail order departments, enabling them to get business beyond the limits of shoppers in person. This phase of the mail order business is rapidly growing and is of increasing economic importance in the retail field.

R. Pl.

MAIMONIDES, MOSES (1135-1204) (Hebrew name, Moses ben Maimon; frequently referred to as Rambam, an abbreviation formed from the initial letters of the Hebrew words for Rabbi Moses ben Maimon), the greatest Jewish philosopher and codifier of the Middle Ages, was born at Cordova, Spain, in 1135.

With his father, Maimon, he was compelled to leave Cordova for Fez, Morocco, in 1160, but after five years, due to religious oppression by the Mohammedans, he went to Palestine. Several years later he became a physician in Fostat. When Egypt, under the rule of Saladin, became a haven of refuge for the Jews, Maimonides had already acquired a great reputation as an outstanding physician and as a rabbinical authority and philosopher, receiving and answering communications on questions of Jewish law from all parts of the world. In 1185 he became body physician to Saladin, and was appointed head (Nagid) of all the Jews of Egypt; later he was the personal physician of Saladin's son and successor, Alafdal. He died in Fostat (Old Cairo), Egypt, in 1204, and was buried at Tiberias, Palestine.

Maimonides was a prolific and constructive author. In 1168 he wrote a commentary on the Mishna in which, in an introduction consisting of eight chapters, he presented a system of ethics. In 1180 he completed his code of Jewish law, in which he incorporated his famous 13 creeds. Maimonides wrote also the *Sefer Hamitzvoth,* or *Book of the Precepts,* dealing with the 613 commands and prohibitions contained in the Pentateuch. His *Moreh Nebuchim,* or *Guide for the Perplexed,* written in Arabic, was completed in 1190. It is an effort to harmonize the apparent contradiction between Aristotelian philosophy and the literal teachings of the Bible. In presenting all religious philosophical problems from the point of view of Aristotelianism it replaces the Neo-Platonic theories heretofore dominant in Jewish religious philosophy. In applying the Aristotelian system of thought to the problems of Jewish religious philosophy reconciling them with the strict tenets of Biblical and Talmudic Judaism Maimonides was quite original.

A. Sh.

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MAINE, SIR HENRY JAMES SUMNER (1822-), English educator who specialized in comparative law, was born at Kelso, Roxburghshire, Aug. 15, 1822. He was educated at Christ's Hospital and Pembroke College, Cambridge. In 1847 he was made Regius Professor of Civil Law and three years later called to the bar. His book, *Ancient Law,* 1861, founded on the lectures he gave at Inns of Court, immediately

established his reputation for legal learning. From 1863-69 he was legal member of council in India, and under his direction plans for the codification of Indian laws were prepared. At the same time he was legislating, consulting and establishing the legislative department of India on its present footing. Maine's experience in India led to his becoming a member of the Secretary of States Council in 1871, where he continued until his death. In 1877 he became master of Trinity Hall, Cambridge, and in 1887, Whewell professor of International Law. His *International Law* came out in 1888, after his death, and without his final revision. Maine died at Cannes, Feb. 3, 1888.

MAINE, one of the New England group of states of the United States, and the most northeasterly state of the Union, popularly called the "Pine-Tree State." It is situated between 43° 4′ and 47° 28′ N. lat. and 66° 57′ and 71° 7′ W. long. On the northwest it is bounded by the Canadian province of Quebec; on the north and east by the Canadian province of New Brunswick, from which it is separated in part by the St. John River, the Grand Lakes and the St. Croix River; on the southeast and south by the Atlantic Ocean, and on the west by New Hampshire. Maine comprises an area of 33,040 sq. mi., inclusive of 3,145 sq. mi. of water surface, with an extreme length of 300 mi. from north to south and an extreme width of 185 mi. from east to west. In size Maine ranks thirty-eighth among the states of the Union.



MAINE STATE SEAL

Surface Features. Maine as a whole is a rugged upland with a mean elevation of 600 ft. above sea level. That portion bordering upon the Atlantic Ocean has been transformed through weathering into low rolling hills which slope gently toward the coast, but the interior and northern parts maintain a rough, uneven topography. An irregular line of isolated mountain peaks, extending from the White Mountains of New Hampshire northeastward through the state, rise to considerable heights above the general level, and the rivers have cut narrow, deep valleys below. Mt. Katahdin, 5,267 ft. high, is the maximum altitude.

Glacial action is chiefly responsible for the intricate variations of surface. The ice sheet scoured out hundreds of rock basins where lakes now exist, and created cascades and waterfalls by changing the courses of rivers. It also removed a large portion of the residual soil, exposing the underlying rocks.

Except for the extreme northern part of the state which is drained by the St. John River, Maine slopes toward the south and its chief rivers, the Androscoggin, Kennebec and Penobscot, empty into the Atlantic. The principal lakes are Moosehead, Rangeley and Chesuncook. The irregular contour of the coast is due to the sinking of the land during the glacial period, which allowed the sea to encroach upon the uplands, creating bays in the place of former valleys, and rocky headlands and islands from former mountain ridges and summits. Casco, Penobscot and Frenchmens bays afford well protected harbors.

Climate. Because of its northern position and proximity to the Atlantic Ocean, the climate of Maine is for the most part cold and moist. Mean annual temperatures range from 45.5° F. at Portland to 39.3° F. at Greenville. The average temperature at Portland is 22.4° F. for January and 68.1° F. for July, at Greenville 12.5° F. for January and 65.2° F. for July. The annual average precipitation at Portland is 41.9 in. including 74.5 in. of snow and at Greenville 42.2 in. Average dates for the last killing frosts in spring range from May 14 at Portland to May 30 at Greenville and those of the first killing frosts in autumn from October 18 at Portland to September 14 at Greenville, giving average growing seasons of 157 days and 107 days respectively.

Forests and Parks. Approximately 78% or 15,000,000 acres of the land area of Maine is forested. Of this total, 9,700,000 acres are wild land townships in the eight northern counties which compose what is known as the Maine Forest District. The remaining 5,300,000 acres are small timbered farm wood lots located in organized townships. Because of the cool moist climate evergreens are the predominant trees. Deciduous trees are found chiefly south of a line drawn through Sebago Lake and the mouth of the Kennebec River and comprise large areas of red and white oak, maple and birch; also black, scarlet, and bear oak and sassafras and black gum. Chestnut oak is found in a single locality. Pitch pine, southern white cedar and red cedar are mixed with the deciduous varieties. The mountains are covered with evergreen forests of white pine, balsam fir, cedar, hemlock and black, red, and white spruce. With the exception of an occasional tree, the original forest area of 18,560,000 acres has been entirely cut over. Maine has no large state owned forests but private forests have been developed for camping and other public recreational uses. These are operated under the jurisdiction of the Maine Forest Service. Nine state monuments, with a total area of 582.13 acres, have been set aside because of their military and historical interest. A 33,482 acre section of the large White Mountain National Forest which lies chiefly in New Hampshire extends into Maine. Acadia, the only national park east of the Mississippi, is on the seacoast.

Minerals and Mining. In variety and extent of deposits and in value of output Maine occupies a minor position, standing forty-first among the states in 1929 with mineral products amounting to $6,748,799. Of these the most important was stone valued at $2,902,603, including granite, $2,155,640, and limestone, $423,571. Next in value were cement $1,155,131, lime $772,443, slate $653,627, clay products $641,364, and feldspar $338,496.

Granite, in which Maine ranks sixth among the states, is the principal quarry product. Extensive granite formations occur near the coast, convenient to water transportation, and also in the interior. During 1929 56 mines and quarries gave employment to 1,284 persons who received $1,789,211 in salaries and wages.

Soil. Throughout the state the soils are quite generally glacial. Because of the prevailingly rugged character of the surface and the uniform precipitation, Maine is naturally a forest region, rather than an area adapted to the raising of crops. In some places, however, the drift soil is highly cultivatable, and along the valleys of rivers and in old lake basins there are alluvial deposits of exceptional richness. Old glacial formations are found throughout the state. The small plains interspersed between the kames in the southwest are especially fertile. Along the coast marine clays prevail.

Agriculture. The chief crops are potatoes, hay, grain and fruits.

In 1930 4,639,938 ac. or 24.3% of the entire land area was in farms, 39,006 in number, with an average size per farm of 119.0 ac. and an average value per acre of $41.87. Of the farm area 1,401,765 ac. was crop land; 1,637,536 ac., pasture land; and 1,362,100 ac., woodland. The total value of farm property was $248,696,418, of which $194,279,884 was represented by land and buildings; $28,382,752, by implements and machinery; and $26,033,782, by domestic animals.

According to the census of 1930 Maine produced in 1929 field crops to the value of $77,084,015, ranking thirty-fourth among the states. Among these crops were vegetables (including potatoes) $60,178,382, hay $9,687,744, grain $3,665,591, and fruits $3,458,914. In the production of potatoes, the chief crop, Maine ranks first among the states, growing in 1929 47,441,580 bu. valued at $56,046,960. The sweet corn produced was valued at $1,319,975. Of the hay crop of 884,740 tons, timothy and clover contributed 623,165 tons. The grains included oats, 3,942,774 bu., and buckwheat, 229,714 bu. The chief fruits were apples, 2,172,709 bu.; blueberries, 3,810,806 qts., and strawberries, 1,137,193 qts. Farm machinery and equipment in 1930 included 26,227 automobiles, 10,781 motor trucks, 3,410 tractors, 5,575 electric motors, and 8,342 stationary gas engines.

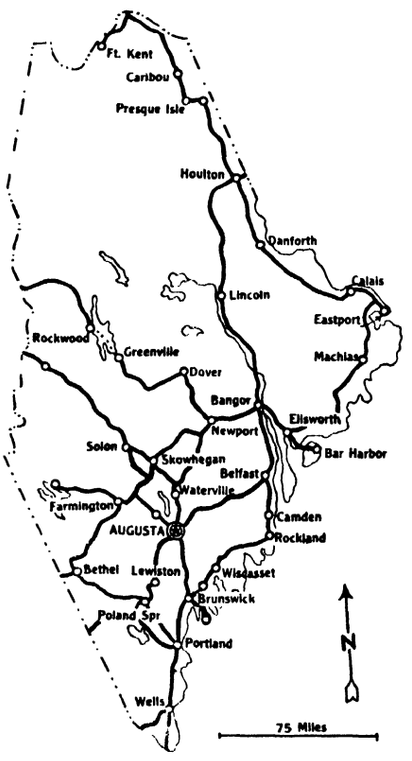
Animal Industry. Dairying, chicken-raising and egg production are the chief livestock interests. According to the census of 1930, Maine ranked forty-second among the states in total value, $26,033,782, of domestic animals on farms. Among these were cattle, 257,048, valued at $15,287,798; horses, 60,958, $7,444,870; sheep, 99,782, $752,986, and swine, 45,712, $694,209.

Of the cows on farms, 152,903 were kept mainly for milk production and 7,717 mainly for beef production. In 1929 71,100,802 gals. of milk were produced; the total value of dairy products sold was $12,527,189. The value of all poultry raised, chiefly chickens, was $4,571,108; the chickens sold were valued at $2,614,373. Of 13,737,577 doz. chicken eggs produced, valued at $5,811,384, 10,207,795 doz., with a value of $4,309,351, were marketed.

Fisheries. In 1930 Maine ranked eighth in the value of its fisheries, the total catch being 162,940,000 lbs., worth $4,897,000. Most important species were cod, haddock, lobsters, mackerel, pollock, hake, herring, winter flounder and clams. The many wilderness streams and lakes which make Maine a fisherman's paradise offer some of the finest trout and salmon fishing in the country. Maine is one of the few states where the fighting landlocked salmon is found.

In 1930, 68,384 fishing licenses were issued and $97,079 was received in fees. Of this amount, $86,182 was spent to operate the 12 state hatcheries, employing 36 men. The output for 1930 included 5,000,000 trout and 2,003,000 other game fish. In addition, the United States Bureau of Fisheries planted in Maine waters: 821,830 landlocked salmon, 821,400 Atlantic salmon, 1,367,302 brook trout, and 1,179,159,000 cod, 124,920,000 haddock and 2,434,538,000 winter flounders.

Transportation. Portland, with one of the finest harbors on the Atlantic coast, has excellent facilities for the handling of ocean-going and coastwise shipping. It is a port of entry, with steamers plying regularly to New York City, Boston and several Canadian ports. The Maine coast has other good harbors, while the Kennebec and Penobscot rivers are navigable for coastwise vessels to Augusta and Bangor respectively. In 1930 the aggregate steam railway mileage was 2,197. The most important systems include the Maine Central, which serves every county



MAINE STATE ROADS

in the state except Aroostook, the Bangor & Aroostook, which provides facilities for the northern farming and summer-resort region, the Canadian Pacific, the Canadian National and the Sandy River and Rangeley Lakes roads.

On Jan. 1, 1930, the state highway system showed a total mileage of 26,779, including 5,777 mi. of surfaced roads and 1,833 mi. of improved state highways. Highway expenditure during 1929 was $14,780,785, of which $12,040,785 was paid by the state and $2,740,000 by county and local governments. The state gasoline tax produced an income of $4,168,890 in 1930. Motor vehicle registrations were 186,157 in 1930 compared with 140,499 in 1925. The growth of transportation by truck is indicated by registrations, which increased from 24,270 in 1925 to 37,435 in 1930, over 50%. During the same period, the number of buses in operation increased from 192 to 314, about 64%.

Manufactures. Maine has long possessed various important manufacturing industries, developed by utilizing extensive forest resources, abundant water power and excellent water transportation.

According to the Census of 1930 Maine with manufactures for 1929 valued at $391,751,334 stood thirty-first among the states. Its 1,568 establishments gave employment to 6,640 officers and employees, who received $16,100,485 in salaries, and to 70,159 wage earners, who were paid $74,199,961 in wages. These factories used a total of 679,153 horse power, expended $12,699,530 for fuel and power, and $204,667,290 for materials and supplies, and added by the process of manufacture $174,384,514 to the value of their output.

In this output there were enumerated 57 separate groups of manufactures. The state stood first in wood pulp, third in woolen goods and in the canning and preserving of fish, fifth in paper, sixth in worsted goods, and ninth in boots and shoes. The five principal products in order of value were paper, $90,072,846; wood pulp, $43,497,951; boots and shoes, $38,931,948; woolen goods, $31,782,318, and worsted goods, $22,119,599.

The leading manufacturing cities with the value of their output were: Portland, $28,267,721; Lewiston, $21,069,612; Auburn, $20,253,640, and Biddeford, $14,244,177.

Finance and Banking. The assessed value of all taxable property in 1929-30 was $743,588,359. Prior to 1912 the state was forbidden to borrow in excess of $300,000, except for emergencies such as war, invasion or rebellion. Several amendments have been passed by the state legislature since, principally in behalf of highways. The total bonded debt in 1930 was $24,258,800. Total state revenues in 1928 were $18,538,804. The principal sources of income were property and special taxes, $7,657,020, and licenses, $8,064,900. This item included insurance, corporation and motor vehicle taxes and also gasoline taxes of $2,555,924. Total payments were $19,011,893, with the principal items highway expenditures, $7,577,687, educational aid, $2,203,132 and operation of general departments and permanent improvements.

There were 183 banks in Maine in 1930, of which 52 were national banks and 131 trust companies and state banks. Their total capital was $13,635,200; their surplus and undivided profits, $39,245,000. Total resources were $474,738,000, with loans and discounts aggregating $231,455,000. Demand and time deposits amounted to $402,221,000. Per capita demand and time deposits were $502.15; per capita savings deposits, $397.32. The total savings of $318,256,000 were owned by 674,444 depositors.

Commerce. According to the census of 1930, there were in 1929 987 wholesaling establishments in Maine, with total sales of $189,975,451. These organizations employed 7,545 men and women, whose annual salaries aggregated $11,287,689. The chief wholesaling center is Portland.

The total sales of the 11,096 retail stores amounted to $309,934,858. Sales per store averaged $27,932; sales per capita were $388.67.

CHIEF RETAIL DISTRIBUTING GROUPS

Group	*No. of Stores*	*Sales*	*% of Total*
Food		$75,962,423	24.51
Automotive		62,583,558	20.20
General Mdse.	1,317	50,264,707	16.21
Apparel	976	26,206,036	8.46
Lumber & Bldg.	591	23,277,332	7.51
Furn. & Household	326	13,833,055	4.46
All other stores		57,807,747	18.65
Total, all stores	11,096	$309,934,858	100.00

Government. The law-making power of the state is vested in the legislature consisting of a senate composed of 31 members and a house of representatives of 151 members, all elected for terms of two years and meeting in biennial sessions unlimited in duration. The chief executive is the governor who is elected for a term of two years at a salary of $5,000 per year. A secretary, a treasurer and a council of seven persons are elected by the legislature to assist the governor. Judicial power is vested in the supreme court consisting of eight judges chosen by the governor and council for terms of seven years at salaries of $6,000 per annum.

Social Welfare Institutions. A State Board of Charities and Corrections supervises these institutions. There is also a Commission for Relief of Needy Dependents of Disabled Veterans of the World War. Many private charities have state aid. The towns and cities care for their poor. A Military and Naval Children's Home is maintained at Bath, a school for feeble-minded at Pownal and a school for the deaf and an institute for the blind at Portland.

State hospitals are located at Augusta and Bangor, sanitariums at Fairfield, Presque Isle and Greenwood Mountain, that at Fairfield taking tuberculosis patients. Reformatories for men are at South Windham, for women at Skowhegan. A reform school for boys is at South Portland and for girls at Hallowell. The state prison is at Thomaston.

Education. The first school in the state was established in the town of York in 1701. This was followed by a school at Wells in 1716. The first public schoolhouse was erected in York in 1725. By 1928-29 there were 4,559 public elementary schools having 4,991 teachers and 124,385 pupils and 234 public high schools with 1,375 teachers and 29,358 pupils. Children from 7 to 15 years of age are required to attend school the full term.

The number of persons, 5 to 20 years of age, attending school in 1930 was 176,349, or 75% of the population within the ages specified, as compared to 151,397, or 69.5%, in 1920. In 1930 the number of persons 10 years and over unable to read and write was 17,172, or 2.7%, as compared to 26,240, or 3.3%, ten years ago.

Among the institutions of higher education the state maintains the University of Maine at Orono, and six normal schools. The more widely known private institutions include Bowdoin College at Brunswick, Bates College at Lewiston, Colby College at Waterville and Bangor Theological Seminary. The Maine State Library, Bureau of Library Extension, has headquarters in the State House at Augusta.

Population. In 1930 Maine ranked thirty-fifth among the states with a population of 797,423 or an average of 26.7 per square mile, an increase of 29,409 or 3.8% over 1920. The population rose from 96,540 in 1790 to 583,169 in 1850, 694,466 in 1900, 742,371 in 1910 and to 768,014 in 1920. There were in 1930 795,183 or 98.7% whites, 1,096 or 0.1% Negroes and 1,012 or 1.1% Indians. Of the whites, 694,815 were native born and 100,368 were foreign born. Of the total foreign stock, including foreign born, foreign and mixed parentage, 99,765 or 35.6% were Canadian French and 101,983 or 36.4% other Canadians. The rural population was 475,917 or 59.7% of the total, an increase of 7,472 or 1.6% from 1920; the urban population was 321,506 or 40.3%, an increase of 21,937 or 7.3% since 1920. There were in 1930 three cities with a population of 20,000 and upwards: Portland, 70,810; Lewiston, 34,948; Bangor, 28,749.

Occupations. In 1930 308,603 persons, or 38.7% of the population, were gainful workers 10 years old or older; 77.8% of these were males and 22.2% were females; 82.3% were native white, and 17.5% foreign-born white. Among the chief occupations, with number of workers, were manufacturing, 113,985; agriculture, 51,462; trade, 33,445; domestic and personal service, 29,124; transportation and communication, 26,175; professional service, 20,188; clerical service, 17,309; forest industry, 5,619, and fishing, 3,494.

HISTORY

Following the Vikings, JOHN CABOT, 1498, was probably the first European to sight the Maine coast. Various 16th century explorers—possibly Gaspar de Corte-Real, 1501; VERRAZANO, 1524; Esteban Gomez, 1525, and others later—were attracted to Maine. Bartholomew Gosnold brought 200 English colonists in 1602, but feared the Indians and did not land. The French planted the earliest actual settlement in Maine in 1604; the first English colony was attempted at the mouth of the Kennebec, 1607, a colony of 120 men under George Popham and Raleigh Gilbert, but was abandoned in 1608. A fortified Jesuit mission on Mt. Desert Island, founded in 1609, was broken up by an English expedition in 1613. The Council for New England (*see* NEW HAMPSHIRE) granted to SIR FERNANDO GORGES and John Mason "the Province of Maine," which in 1629 was divided between the two proprietors, Gorges taking the territory between the Piscataqua and the Kennebec. He fostered settlement liberally, and Pemaquid, 1625-1626, York, 1626, Saco, Biddeford, Cape Elizabeth, Scarboro, and Falmouth (Portland), 1630-1632, took permanent root. William Gorges convened the first court in the province at Saco in 1636. A royal charter in 1639 failed materially to strengthen the position of the province, because of conflicting grants, notably the Lygonia patent from Cape Porpoise to Casco Bay, and the aggressive interpretation by Massachusetts of its chartered boundaries. Maine was gradually annexed to Massachusetts. When in 1677 the king in council decided against the Puritan colony, Massachusetts purchased the Gorges claim for £1,250. Maine, its northern boundary extended to the St. Croix, despite the French claim to all territory east of the Penobscot, became an integral part of Massachusetts by the terms of the 1691 charter.

Agriculture, fishing, the production of naval stores, and maritime commerce were the leading pursuits. A frontier region, democratic and separated from Massachusetts geographically and in economic interests, Maine early considered the desirability of independence; but not until 1819, when Congress rearranged its customs districts so that coasting vessels from Maine did not have to register at Boston on every trip, were separation measures carried by decisive majorities. Maine was admitted to the Union, Mar. 3, 1820, with Portland as its capital. The location of its northeastern boundary was a subject of dispute between the United States and Great Britain, and in the TREATY OF GHENT, 1814, was referred to a commission. The decision of the arbitrator in 1831 was protested by Maine, and rejected by the U.S. Senate. After an interval marked by the AROOSTOOK WAR, the subject was treated in the WEBSTER-ASHBURTON convention. In 1853 Maine paid Massachusetts $362,500 to extinguish the latter's claim to the disputed area. Maine was the first state to adopt prohibition, 1846, and the revised law of 1851 became the model for other states which barred the liquor traffic. A strongly Republican state, with the exception of the election of 1912, Maine in November, 1932, gave its five electoral votes to Hoover. In the state elections in September, however, Louis J. Brann, a Democrat, was elected to the governorship of the state.

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MAINE, DESTRUCTION OF THE, a tragic catastrophe which, by inflaming popular sentiment in the United States, became a contributory cause of the SPANISH-AMERICAN WAR. In Jan. 1898 the United States Consul-General at Havana reported that the lives and property of foreigners in that city were threatened by political disturbances, and advised sending a vessel to land troops, if needed. The battleship *Maine* was accordingly sent to the port of Havana. On the night of Feb. 15 the battleship, at anchorage, was destroyed by an explosion and 260 men were killed. The popular impression in the United States was that an outrage had been perpetrated with the connivance of Spanish officials. A naval court of inquiry, appointed by President McKinley, ascribed the destruction to an external explosion; an investigating board in 1911 upheld this finding, but could not determine whether the explosion was accidental, or was the result of a deliberate plot by Spanish or Cuban sympathizers.

MAINE, UNIVERSITY OF, at Orono, Me., a coeducational state university, founded in 1865 as a State College of Agriculture and the Mechanic Arts under the provisions of the Federal Land Grant Act of 1862. The name was changed to the University of Maine in 1897. The university comprises colleges of Arts and Sciences, Agriculture, Technology, and Law, and maintains an agricultural experiment station. In 1931 the productive funds totaled $1,555,472. The library contained 103,000 volumes. There was a student enrollment in 1931-32 of 1,682, and a faculty of 167 headed by Pres. HAROLD S. BOARDMAN.

MAINTENON, FRANÇOISE D'AUBIGNÉ, MARQUISE DE (1635-1719), second and morganatic wife of Louis XIV and daughter of a penniless man of good birth. Her family sailed for Martinique in 1639 with the intention of retrieving the family fortune, an object which was not fulfilled, and on the death of the father, the widow with her son and daughter returned to France. In 1650 Madame d'Aubigné died and Françoise was left penniless. Scarron, the crippled comic poet, took pity on her and offered her marriage. She accepted, her only alternative being a nunnery. When her husband died she was once more thrown on her own resources and became governess to the illegitimate children of the king. Rising rapidly in the king's favor, at the age of 51 when Louis was only 48, a marriage took place between them. Her reactionary influence over the king increased as he grew older and his revocation of the Edict of Nantes is attributed partly to her. In 1686 Madame de Maintenon founded a school for poor girls of good family at St. Cyr and retired there on the death of Louis, whom she outlived for four years. She died on Apr. 15, 1719.

MAINZ or **MAYENCE,** a city in the German free state of HESSE, located on the Rhine opposite the mouth of the Main River. It lies in one of the most beautiful and historic sections of Germany. Since the fortifications were built at a greater distance from the city, the city was able to expand in their direction, particularly to the north. The market place, with its quaint houses and fountains, and the promenades, with their fine views, are noteworthy, as are the churches. St. Martin's Cathedral, a Romanesque edifice, begun in 978, was destroyed and rebuilt several times, assuming its present form in the 13th and 14th centuries. St. Ignatius's Church, a handsome baroque structure; St. Stephen's, begun in 1257, a fine early-Gothic edifice on the highest point of the city; the Church of Our Lady; St. Peter's, dating from 1756; and the modern Protestant church are all notable buildings. Among the secular buildings are the former ducal palace, which once belonged to the Teutonic Order, and the former electoral palace, which houses a collection of Roman and early German antiquities, and the municipal library. There are about 30 highly diversified industries and a lively trade in coal, lumber, grain and petroleum, aided by extensive harbor facilities. Mainz is the center for trade in Rhine wines. Pop. 1925, 108,537.

History. In prehistoric times there was a Celtic settlement on the site of Mainz. There Agrippa, in 14-9 B.C., built a fortress around which trading settlements grew and developed into a municipality. Mainz became capital of the Roman province of Upper Germania. After the fall of the Roman Empire, the city was repeatedly plundered and destroyed. Bishop Sidonius was founder of the new city in the 6th century. St. Boniface, metropolitan of Germania in 732, was made first archbishop over 11 bishoprics, and was followed by his disciple Lullus, who founded a large number of churches and abbeys. Among his successors were many statesmen who played a decisive part in German history. Willigis, in 975-1011, was authorized by the pope to preside over all German and French councils and to crown the German kings. He rebuilt the cathedral and began a new epoch of ecclesiastical splendor; and with him began the secular power of the archbishops. Later ones set kings upon the German throne. In the 15th century Mainz became a book printing center; here it was that JOHANNES GUTENBERG, 1400-68, set up and printed the first Bible. A Gutenberg Museum and his statue by Thorwaldsen now attest the honor of the city, though in 1420 the Gutenberg family was expelled by the early Mainz burghers. In 1476, a university was opened and continued until 1798. The Thirty Years' War broke the power of the archbishops and the French Revolution finished it. Until then, the archbishop, elected by the cathedral chapter, had been, as elector, temporal ruler over large territories and arch-chancellor of the German Empire, primate of Germany. He presided over the Reichstag, in the electoral college, and at the election of emperors. The archbishopric was secularized in 1803.

MAIPU, a volcanic peak of the Andes, the Western Cordillera of Argentina, situated on the Chilean frontier, in 33° 50′ S. lat. Rising to a height of 17,600 ft. Maipu is now extinct; there are no active craters on the Argentine side of the Cordillera, although there is abundant evidence all over the Andine region that many craters of the Andes have been re-

cently in comparative activity. On the slopes of Maipu the *Gramineas* are the most notable flora and form large areas interspersed with many varieties of flowers. The Espinillo (*Acacia aroma*) tree is cut for firewood and brought down to Buenos Aires. The tree has golden balls of flowers from which is extracted an oil used in perfumery.

MAISON CARRÉE, a Roman temple at Nîmes, southern France, dedicated between 1-14 A.D. to Caius and Lucius Caesar, the adopted sons of the Emperor Augustus. It is well preserved and is the most perfect of its type still standing. The Maison Carrée was built in rectangular form, 82 ft. long, 40 ft. wide and 40 ft. high. Twenty of its 30 Corinthian columns are attached to the walls of the cella. Used at various times as a church, municipal hall, warehouse and stable, it was restored in 1824 and now contains the municipal collection of antiquities.

MAIZE, a name given to Indian corn, a valuable cereal plant of the grass family, in America called simply CORN. The word maize is derived from a native West Indian name.

MAJOLICA, a term applied to the Italian earthenwares which were coated with a tin enamel and then decorated. They were produced between the 14th and 18th centuries. These wares, with other varieties of the same technical group, including Delft from Holland, the tin enameled products of France and other European countries and any other kind of enameled EARTHENWARE, are grouped together under the collective denomination of faience. Majolica might properly be termed a ceramic decorative process, as *pâte-sur-pâte* is a decorative process in PORCELAIN. The bluff or red earthenware body was coated with a tin enamel glaze, and the decorations, mostly of a pictorial nature, were painted over the unfired enamel. Utilitarian articles, wedding gifts and presentation pieces were decorated with appropriate subjects, generally adaptations from the paintings and engravings of the old masters.

One of the exponents of the art, Cipriano Piccolpasso, of Castel Durante, left a treatise, now in the South Kensington Museum, on the art of majolica as practiced in the 16th century. It is thought that over 100 Italian towns and cities produced majolica between the 16th and 18th centuries, and that more than half of these were active as early as the 16th century. Some of the best known centers were Castel Durante, Urbino, Caffagiolo, Gubbio and Faenza, whence the name faience is derived. Among the great majolica artists were the Della Robbias, Nicola da Urbino, Maestro Giorgio and Xanto. F. H. R.

MAJOR, CHARLES (1856-1913), American novelist, who wrote under the name Edward Caskoden, was born in Indianapolis, Ind., July 25, 1856. He practiced law at Shelbyville, Ind. Between 1898 and 1912 he published several novels which were extremely popular with young people, notably *When Knightwood Was in Flower,* 1898, *Dorothy Vernon of Haddon Hall, Uncle Tom, Andy Bill* and *The Little King,* 1910. Major died at Shelbyville, Feb. 13, 1913.

MAJOR, in music, a word qualifying intervals and modes. With reference to the scale it signifies that mode, or scale construction, based on the use of the major third above the keynote instead of the smaller or minor third used in the minor mode. The major sixth and major seventh are also characteristic intervals of the major mode, although they are not exclusively so, being used in the ascending form of the melodic minor scale. The major mode is generally more cheerful than the minor, a phenomenon partly accounted for, in the opinion of many theorists, by the fact that the chord of nature produced by the first five partials or natural harmonics is invariably major, the minor third being given by nature only in the series of under-tones. Otherwise expressed, the minor third, and hence the minor mode, disappoints the natural expectation of the auditor who, whether consciously or not, is continually hearing the major third produced by overtones.

With reference to an interval in Greek music (*see* MUSIC: *Greek*) and JUST INTONATION, known as a TONE, major signifies the greater interval expressed by the ratio 9:8. A major tone, as from C to D, is such an interval expressed by the ratio just given because, in terms of vibration frequency D:C::9:8; the interval from D to E, on the other hand, is a MINOR tone.

MAJORCA (Spanish *Mallorca*), a Spanish island of the Mediterranean, and the largest of the BALEARIC ISLANDS, lying about 110 mi. southeast of Barcelona and covering an area of 1,317 sq. mi. The surface is irregular with mountains rising to 5,000 ft. above the sea and fertile valleys between them. Agriculture is the chief occupation. All the cereals of the Mediterranean areas and many fruits thrive here, particularly olives, grapes and oranges. The manufactures include linen, silk and woolen cloths, brandy, ropes and shoes. The chief city is PALMA, the capital of the Balearics. Manacor, Felanitx, Andraitx, Inca and Pollensa are other important towns. Est. pop. 1929, 269,000.

Majorca was conquered from the Saracens by James I of Aragon in 1230, and with the other Balearic islands and the counties of Rousillon and Montpellier was detached from the kingdom of Aragon and set up as the kingdom of Majorca for James's younger son, James I of Majorca. James I of Majorca soon lost his kingdom, reconquered it in 1291, and abdicated in favor of his brother Sancho who ruled until 1324. Sancho was followed by his nephew, James II, who soon was involved in war with his relative, Peter IV of Aragon. By 1343 Peter had recovered all the kingdom of Majorca for Aragon, and in 1349 James II was killed while vainly trying to recover his lands. One of James II's sons took the title of James III of Majorca, but never ruled there. He was captured by the Aragonese in 1349, and died in 1376.

MAJOR GENERAL. *See* GENERAL.

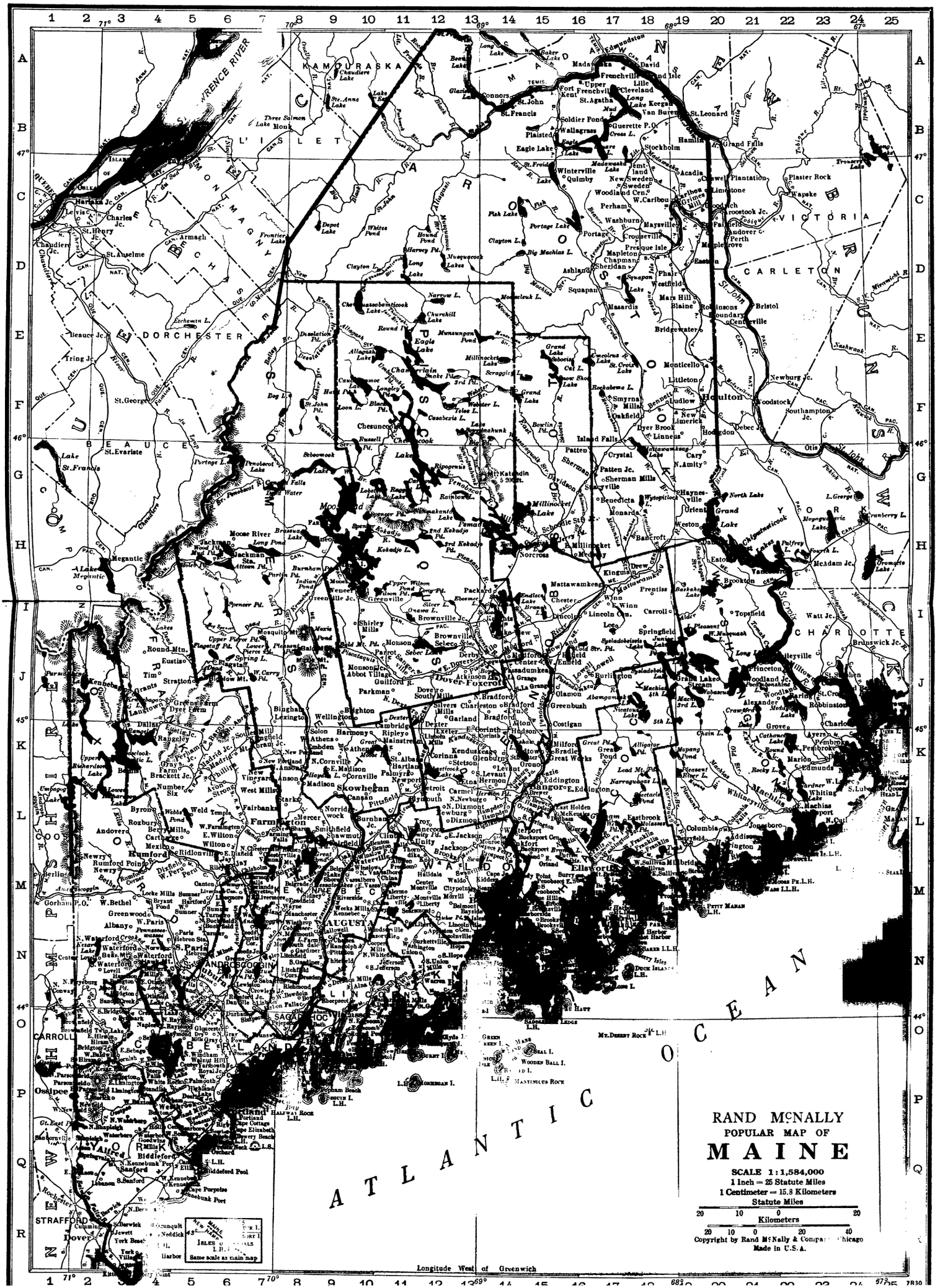
MAJORITY, technically a term meaning the larger number. In popular elections and deliberative assem-

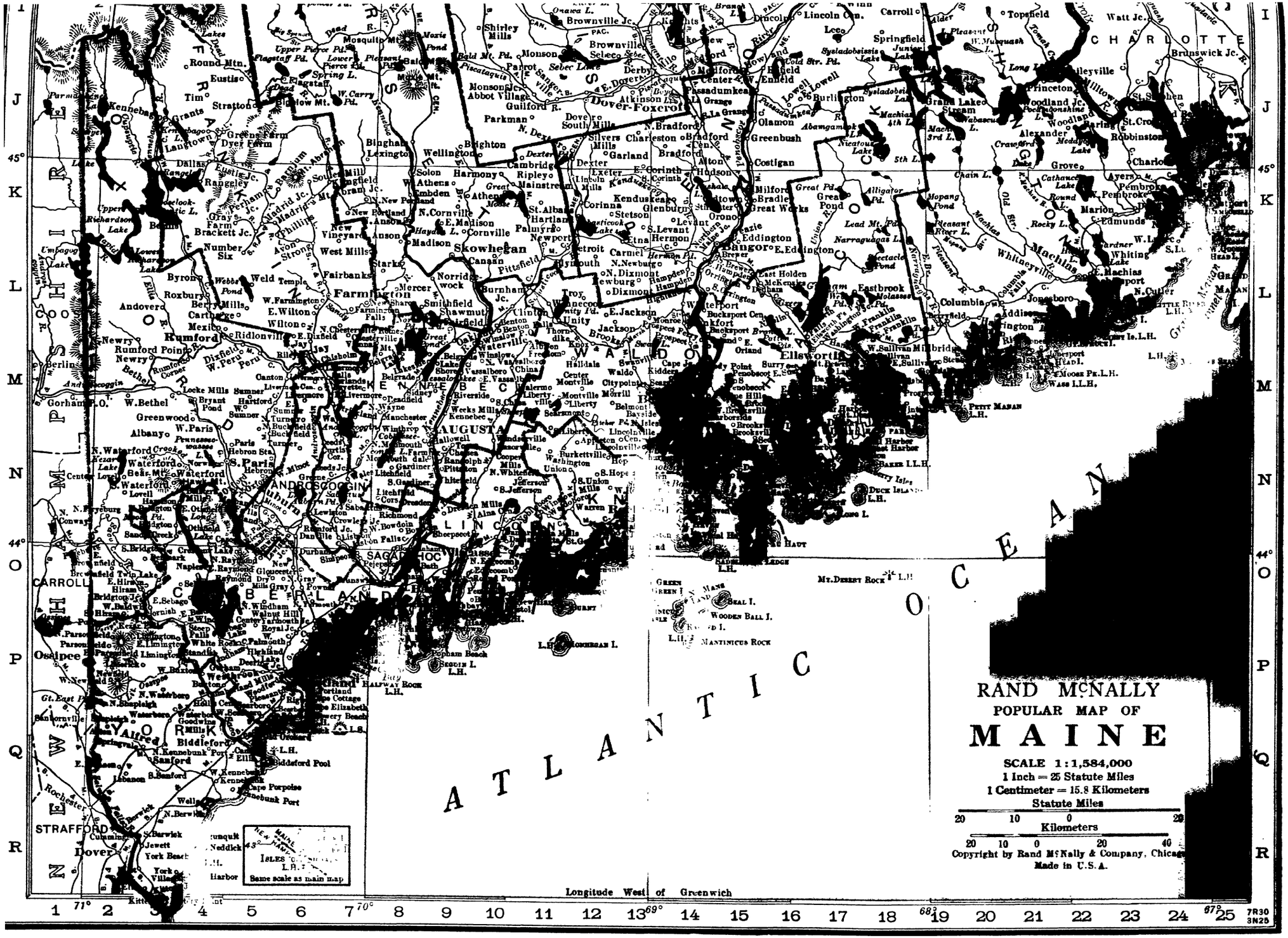


1. COURTESY CHAMBER OF COMMERCE, AUGUSTA; 2, 3, 4. MAINE DEVELOPMENT COMMISSION

GOVERNMENTAL, INDUSTRIAL AND SCENIC VIEWS OF MAINE

1. State Capitol at Augusta. **2.** Town of Rumford, one of the busiest industrial centers of the state; the Androscoggin River is in the foreground. **3.** Looking down from the top of Mount Battle to the village of Camden and its harbor. **4.** Portland Head Lighthouse.


RAND McNALLY
POPULAR MAP OF
MAINE
SCALE 1:1,584,000
1 Inch = 25 Statute Miles
1 Centimeter = 15.8 Kilometers
Statute Miles
20 10 0 20
Kilometers
20 10 0 20 40
Copyright by Rand McNally & Compa... Chicago
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ATLANTIC OCEAN
Longitude West of Greenwich
Same scale as main map


RAND McNALLY
POPULAR MAP OF
MAINE
SCALE 1:1,584,000
1 Inch = 25 Statute Miles
1 Centimeter = 15.8 Kilometers
Statute Miles
20 10 0 20
Kilometers
20 10 0 20 40
Copyright by Rand McNally & Company, Chicago
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ATLANTIC OCEAN
Longitude West of Greenwich
71° 70° 69° 68° 67°
Same scale as main map
7R30
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blies it is customary to decide issues by majority vote, although in some situations "the consensus of the meeting" rather than a mere majority still renders the formal verdict. The requirement of extraordinary majorities in connection with constitutional changes and other matters of exceeding importance indicates perhaps that majority vote is a matter of convenience rather than one of inherent sanctity.

MAJUBA HILL, the scene of a British defeat by the Boers in 1881 during the first Boer War. Sir George Calley, the British commander, was killed. It became a political war cry in England when Gladstone agreed to the independence of the Boers without "avenging" Majuba Hill. *See* BOER WARS; TRANSVAAL.

MAKEREADY, the work of preparing printing plates for the press, coming between IMPOSITION and PRINTING. If perfect printing plates were possible, makeready would be unnecessary. In practice, however, the attention the pressman must give to how the printing surface meets the paper assumes such importance that frequently it alone is thought of as makeready. The first care is to see that the printing surface is perfectly level and type high. Then, if it is desirable to emphasize certain details of the print, patches of thin paper are pasted to the packing sheets, accurately registered to position. This overlay imparts a slightly heavier impression to those details, causing them to print more distinctly.

Mechanical overlays are made by printing the plate upon a special chalk-coated board, which is then placed in an etching solution. The inked portions are protected from the solution, which attacks the unprotected areas and dissolves away the chalk surface. Having been registered into position in the press packing, the plate is ready for printing. E. W. P.

MAKEUP. *See* PROOFS.

MAKINO, NOBUAKI, COUNT (1851-), Japanese statesman. He entered political life as private secretary to the then Premier Count Ito in 1888. After serving as Minister to Italy and to Austria-Hungary, he was appointed to the Privy Council in 1909. He was Minister of Agriculture and Commerce 1911-12, Minister for Foreign Affairs 1913-14 and Minister of the Imperial Household 1921-25 when he was appointed to the post of Lord-Keeper of the Privy Seal.

MALABAR, a district of British India, included in the Madras Presidency. It is a strip of territory stretching for about 150 mi. along the coast, covering an area of about 5,700 sq. mi. The territory extends into the interior for a distance varying from 30 to 70 mi. Wooded slopes and fertile valleys characterize the surface and the coast is broken up by lagoons which are connected by canals for transit. Rice and fruits are grown in abundance. Fishing, the manufacturing of coir, tiles and soap are important industries. The main exports are spices, coconuts and coffee. The forests of Malabar yield valuable lumber. CALICUT is the administrative center. Pop. 1921, about 3,000,000; 1931, 3,522,418.

MALACCA, a town of the Malay Peninsula, situated near the mouth of the Malacca River on the west coast. With a territory of 720 sq. mi. around it, it constitutes one of the Straits Settlements. Before the rise of Singapore, Malacca was an important center of commerce, but now few ships visit it. It is, however, important historically, being one of the oldest European settlements in the East. The Portuguese under Albuquerque occupied it in 1511 and held it till 1641 when the Dutch took possession. The English captured it in 1795. Est. pop. of the town and settlement 1928, 194,342.

MALACHI, BOOK OF, is the last of the minor prophetical writings in the canonical Old Testament. The world *malachi* may be a title, for it does not occur elsewhere and in the Hebrew is a contracted form of "the messenger of Jehovah." The Targum of Jonathan ben Uzziel closes the first verse with the addition, "whose name is called Ezra the scribe." Tradition has also ascribed it to Nehemiah and Zerobabel. Many modern scholars hold that the book was written when the exile was in the past, because of its stress on ritual, a characteristic which makes the book significant, as leading to the Judaic formalism of the Pharisees.

MALACHITE, a green mineral frequently found in the upper part, or oxidized portion, of copper deposits, especially in arid countries. It is a hydrous copper carbonate, differing from AZURITE, the blue carbonate, in having a little more water in its composition. It crystallizes in the MONOCLINIC SYSTEM, sometimes in needle-like crystals. Ordinarily it occurs in solid masses or as crusts with a botryoidal surface, and is almost invariably banded irregularly. It is also found as stalactites and stalagmites. Malachite is usually associated with other copper minerals, since it is derived from them by WEATHERING, and with LIMONITE.

Where it is abundant, malachite forms a valuable ORE of copper because of the ease with which it is reduced to the metal. Noteworthy occurrences are found in Arizona, Utah and New Mexico in the United States, and in South America. It is also found in the Ural Mountains, and in France, Germany, England and Cornwall, in Cuba, Africa and Australia. The compact, banded varieties are cut and polished for use as ornamental stone and in jewelry. *See also* ORE DEPOSITS; GEM STONES.

MALACHY, ST. (1095-1148), Irish archbishop, was born in Armagh, Ireland, in 1095. He rose from the position of priest to that of abbot and at last bishop. As archbishop of Armagh, in 1132, he began to show the organizing and administrative ability that soon raised the Church of Ireland to something of its former greatness. Finally Pope Innocent II appointed him papal legate in Ireland. On returning from one of his many visits to Rome, St. Malachy died at Clairvaux in the Cistercian abbey ruled by his friend St. Bernard. St. Bernard has left a glowing account of the life of St. Malachy. In 1590 a collection of mottoes prophesying the future of the

Catholic Church and its popes, which were said to be written by St. Malachy, was found in Rome. The saint died Nov. 2, 1148, and his day is kept on Nov. 3.

MÁLAGA, a city of Spain, capital of the province of the same name, an important commercial city and Mediterranean seaport. The old part of the city has uneven and irregular streets, while the newer sections have straight, wide streets with modern buildings and several attractive public squares. Among the few noteworthy buildings is the cathedral, begun in the early 16th century, which is filled with numerous works of art. Nearby is the bishop's palace and the large custom house. The view from the old Moorish citadel on the hill is charming Málaga was founded by Phoenicians and passed through the hands of Carthaginians, Romans, Goths and Arabs and various Christian princes, until it was united with Granada in the 14th century. Industry has increased greatly and includes foundries, machine and textile factories, and many others. The exports are double the imports in value. Est. pop. 1929, 160,228.

MALAPROP, MRS., a character in Sheridan's RIVALS. Aside from her part in the story as aunt of Lydia Languish and would-be wife of Sir Lucius O'Trigger, she is a continuous source of comedy in her refined misuse of words. According to her, she intends to fly with the utmost felicity and has no wish to be precipitated down a prejudice headstrong as an allegory of the Nile.

MALARIA, the most important of all diseases of tropical and sub-tropical countries, characterized by periodic attacks of chills and fever. It is sometimes acutely fatal, often slowly saps the vitality and in any afflicted country it influences adversely the birth rate, the longevity and the stamina of the people. An uncomplicated, untreated malarial infection presents a striking clinical picture in which fever, anemia and enlargement of the spleen are dominating factors. These may disappear after a variable period only to recur later in what is termed a relapse. Thus, the disease is often of long but not of continuous duration and generally tends slowly toward recovery.

There are three types of malaria, known as *tertian,* aestivo-autumnal and quartan malaria. A primary infection of the tertian type is characterized by paroxysms of fever every other day, at which time there is a sharp rigor, a quick onset of fever, profuse perspiration, then a rapid fall in temperature. Simple cases of *quartan* fever exhibit paroxysms every third day and *aestivo-autumnal* is somewhat irregular. Multiple or mixed infections occur and are characterized by irregular paroxysms. Where malaria is endemic, constant exposure to infection gives rise to a chronic form which is manifested by varying degrees of fever, anemia and enlargement of the spleen. Sometimes the disease assumes epidemic form and flares up with a prostrating and often fatal effect in endemic as well as in malaria-free communities. In this aspect, there is an intensity of infection, a protracted sickness and an unprecedented rise in mortality. When the epidemic is over, malaria is almost universal and is accompanied by intense anemia, emaciation and prostration. This form of the disease, which is called acute malarial cachexia, varies markedly with the individual.

Although the disease has been recognized throughout the ages, it was not until 1880 that LAVERAN incriminated the spherical pigmented bodied and the filiform elements resembling flagella in the blood cells of a malarial patient as the cause. Eighteen years later, Ross proved conclusively that it was transmitted by the mosquito and in the same year McCallum demonstrated that the flagella-like bodies described by Laveran were sexual stages which normally develop within the mosquito.

The three types of malaria are caused by three species of very similar protozoa, i.e., unicellular animals which are protozoa, known as *Plasmodium vivax, P. falciparum* and *P. malariae.* The life cycles of these three species are essentially similar, and involve an asexual cycle in man and a sexual cycle in the mosquito. The minute infective form from the mosquito (sporozoite), consisting of a nucleus surrounded by a bit of cytoplasm, enters a red blood cell, grows and divides (schizonts) into a number of forms similar to the original infective form (merozoites) which then rupture the red cell and infect new cells. The growth and division of the parasite takes 48 hours for the tertian and aestivo-autumnal parasites and 72 hours for the quartan, and continues uninterruptedly unless checked by some adverse factor, such as quinine or the body's defense. Moreover, the growth and division of all of the parasites takes place more or less regularly, so that examination of blood at a given time will often show a predominance of one particular form. This synchronicity in growth of the parasites is the most conspicuous characteristic of malaria and seems to be responsible for the encountered regularly occurring paroxysms. (*See also* PARESIS.)

Throughout the asexual cycle, a small percentage of large forms, known as micro- and macrogametocytes, make their appearance. These are the sexual male and female forms which only develop further if taken up by certain species of Anopheline mosquitoes. In the proper mosquito the microgametocyte forms six to eight small microgametes; one of these fuses with a macrogamete to form a zygote. The zygote makes its way to the stomach wall, where it undergoes a period of intense growth and division with the subsequent formation of several hundred sporozoites. Some of these eventually make their way to the salivary glands, where they lie ready to be injected when the mosquito bites.

Since the parasite is found in the peripheral blood, the surest diagnosis of the disease is effected by making a blood film, staining and looking for parasites. The only attendant difficulty lies in the fact that the organisms are sometimes so scarce that prolonged search will not reveal them.

The chief defense in man against malaria is assumed by a far-flung system of cells, known as the reticulo-

endothelial system, which are found predominantly in the spleen and to a lesser extent in the liver, lymph nodes, bone marrow and blood. These cells are preeminently phagocytic, i.e., they eat almost any foreign particulate or colloidal material that enters the blood stream and their activity appears to be responsible for the eventual decrease of the parasite and hence of the disease. The defense of the body is materially aided by the administration of quinine, which is one of the few drugs known in medicine to act specifically upon a disease-producing organism. This drug is used in the form of quinine sulphate or hydrochloride. Recently another somewhat similar compound, known as plasmochin, has been found to be especially effective against the gametocytes.

The economic losses due to malaria make its control of paramount interest, but the procedure employed varies tremendously in different areas. Generally a preliminary survey is made to determine the prevalence of malaria and the particular species responsible for the transmission of the disease. The latter is of extreme importance when it is realized that only mosquitoes belonging to a certain group known as Anopheles carry malaria, that one species may be dangerous in one area and practically harmless in another and that mosquitoes may breed in almost any conceivable collection of water. The eggs, which the mosquitoes lay on the surface of water, hatch into larvae that eat various débris in or on the surface of the water. Later the larvae change into non-feeding pupae which in turn metamorphose into adult mosquitoes. The most efficient control measures are directed toward abolishing the breeding places of the mosquitoes by draining, filling in ponds and clearing shaded areas, or killing the larvae by maintaining a thin film of larvicides, such as petroleum oil or Paris green, over the breeding places. *See also* TROPICAL MEDICINE. W. H. TA.

MALATYA or **MALATIA,** a city of Asiatic Turkey, capital of the vilayet of Malatya, situated about 10 mi. southeast of the Euphrates on the Samsun-Diarbekr Railway. Nearby are the ruins of ancient Malatya or Melitene, which the Emperor Trajan raised to the status of a city. Grown in size and importance, Melitene was made the capital of Armenia Secunda, and later of Armenia Tertia. The city was owned by Romans, Saracens, Byzantines and others until 1102, when the Sultan Kilij Arslan took possession of it. In 1893 Malatya was destroyed by an earthquake, and two years later the Armenian Christians there were the victims of a massacre. The region is celebrated for its rich and extensive orchards. Pop. 1927, 76,339.

MALAY, a language of the INDONESIAN branch of the MALAYO-POLYNESIAN linguistic family spoken by some 3,000,000 persons, chiefly in the Malay Peninsula, and usually written in Arabic, though sometimes also in Roman script. Gender is lacking, and the noun is inflected by means of affixed or prefixed particles, while the plural is indicated by words meaning "many," etc., or by reduplication, e.g., *būdaq,* "child," *būdaq-būdaq,* "children." Pronouns denote the person and number of the verb; and various auxiliaries, adverbs, prefixes and suffixes show its type (state of being, action, transitive, causative, frequentative or intensive, and reciprocal or simultaneous), mood (indicative, imperative, subjunctive, optative, interrogative and vetative or prohibitive), and tense (chiefly present, past and future). The passive construction is preferred to the active ("by the man (is) shut the door" = "the man shuts the door"). L. H. G.

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MALAYALAM, a DRAVIDIAN language spoken by about 6,000,000 persons on the Malabar coast of India. It is a modern offshoot of TAMIL, from which it differs chiefly in the loss of all personal terminations of the verb and in a large admixture of words borrowed from SANSKRIT. The written literature, which begins in the 14th century, has also been profoundly influenced by the same source, Malabar having been for centuries a repository of Sanskrit lore and old Brahmanical traditions.

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MALAY ARCHIPELAGO, the largest system of island groups in the world, washed on the east by the Pacific and on the west by the Indian Ocean. The archipelago comprises some of the world's largest islands, among them being the Philippines, the Sunda Islands, which include Sumatra, Java, Bali, Lombok, Timor and a large number of smaller islands, the Moluccas, Celebes and hundreds of others. The total area of the islands of the Malay Archipelago is over 1,000,000 sq. mi. and their combined population is estimated at about 60,000,000. Nearly all of the islands are mountainous, the highest point of the archipelago being Kinabalu Peak in Borneo. It rises to a height of 13,700 ft. above the sea. The surface of most of the islands is covered with tropical vegetation and there is a large number of active and extinct volcanoes. Of the variety of tropical fruits grown, the principal ones are oranges, mangos and bananas. Coconuts, breadfruit and sugar-palm are extensively cultivated.

The Portuguese arrived and began trading in the Malay Archipelago in the early part of the 16th century but later were supplanted by the Spaniards and the Dutch. The latter now control almost the entire archipelago, with the exception of the Philippines, which belong to the United States, and northern Borneo and southern New Guinea, which are British. *See also* DUTCH EAST INDIES; JAVA; BORNEO; SUMATRA.

MALAYO-POLYNESIAN, a Linguistic family spoken in the Malay Peninsula, Madagascar and Oceania, and divided into Indonesian, Melanesian, Micronesian and Polynesian (*see* these under their separate titles). They are characterized in general by a BASE accented on the first syllable, which appears as dissyllabic, though usually analyzable as a monosyllable plus a DETERMINANT; by absence of inflection, number and gender in the noun; and by

formation of various types of verbs (transitives, intransitives, causatives, reciprocals, frequentatives, etc.) by means of prefixes, suffixes and infixes.

MALAY PENINSULA, an extension of the continent of Asia into the China Sea, forming the most southerly part of Asia. It is bounded on the west by the Strait of Malacca, on the east by the China Sea, on the north by Siam, and on the south by the Strait of Singapore. The peninsula is about 700 mi. long and 200 mi. at its greatest width, covering an area of about 100,000 sq. mi. The surface is mountainous and covered with magnificent forests, which are famous for their timber. The mountain peaks range in height from 7,000 to 8,000 ft. Besides being noted for the valuable woods, like camphor, teak, sandalwood, ebony, rattan, cocoa palm, the peninsula is also known for the vast deposits of tin. Politically the peninsula is divided into three parts, comprising the Straits Settlements, the Federated Malay States and the Unfederated Malay States. The population is estimated at 3,500,000. Half of it is Malay, the remainder Chinese, Indian and European.

MALAY RACE, in anthropology. *See* RACES OF MANKIND: *Mongoloid Group.*

MALAY STATES, FEDERATED, native Mohammedan states under British protection, situated on the MALAY PENINSULA of southeastern Asia.

The areas and populations of the states are:

Perak	7,800 sq. mi.	599,055
Selangor	3,156 "	401,009
Negri Sembilan	2,550 "	178,762
Pehang	14,000 "	146,064

Out of the total population of 1,324,890 no less than 853,528 are males and only 471,362 are females. This anomaly is due to the large numbers of Indian and Chinese immigrants, mostly of the coolie class, who do not bring their womenfolk until they settle permanently. The racial proportions are: Malays, 510,821; Chinese, 494,548; Indians, 305,219; Europeans, 5,686; Eurasians, 3,204.

Each of the four states is ruled by a sultan, who is advised by a British resident. Negri Sembilan is really a complex state formed by the union of nine small states in 1889. Sungai Ujong joined the union in 1895. British protection dates from 1874, when residents were appointed to Perak, Selangor and Sungair Ujong; the federation dates from 1896, when a treaty was made between the British government and the four protected states.

The riches of this prosperous federation are derived largely from the two main commercial enterprises: the cultivation of rubber and the mining of tin. Kuala Lumpur in Selangor is the largest city and the center of commercial activity. It has a population of 80,000. The staple products of the states are rubber, rice, coconuts, sugar, tapioca and pepper. Leading exports are rubber, tin ore and copra; imports, rice, cotton goods, petroleum products and sugar.

MALAY STATES, UNFEDERATED, the five states, Johore, Kedah, Perlis, Kelantan and Trengganu, of the Malay peninsula not included in the Federated Malay States. Johore, situated on the tip of the peninsula, occupies an important position, separating Malacca and the Federated States. It has an area of 7,678 sq. mi., a population (1931) of 505,309, including Malays, Chinese, Indians and Tamils. Johore has shared more or less automatically in the rapid development of the Federated States and has a large export of rubber and copra, areca nuts, tin and tapioca. It is joined to Singapore by a causeway across the Johore strait. The four northern states are less developed than Johore. They are mainly agricultural, but rubber planting has become important, especially in Kedah and Kelantan. The area of Kedah is about 3,150 sq. mi. The population (1931) was 429,645, of whom about 240,000 were Malays and 60,000 Chinese. Perlis has an area of 316 sq. mi. and a population (1931) of about 45,000. The area of Kelantan is 5,713 sq. mi.; population (1931) 362,622. Trengganu has an estimated area of 5,500 sq. mi. and a population (1931) of about 179,664.

Johore entered into a treaty with Britain in 1885; the remaining four states lie along the Siamese border and the rights of suzerainty and protection were handed over by Siam to Britain in 1909. In all five states the ruling sultan is assisted by a council and acts under the advice of a British representative.

MALBONE, EDWARD GREENE (1777-1807), American painter, was born in Newport, R.I., Aug. 1777. He received some instruction from a scene painter and drew a successful portrait at the age of 16, then located in Boston as a miniature painter. In London he painted *The Hours,* his best miniature, now in the Providence Athenaeum. Malbone is considered the foremost American miniature painter; he also did work in oils and portraits. The artist died May 7, 1807, at Savannah, Ga.

MALDEN, a city of eastern Massachusetts, in Middlesex Co., on the Mystic River, 5 mi. north of Boston. It is on the Boston & Maine railroad and surface and elevated lines from Boston. Although a residential suburb of Boston, it is also an important manufacturing center, with local industries producing rubber and leather goods, soap, linen and sweaters. In 1929 the total output of manufactures was $26,230,346. In 1649 Malden separated from Charlestown, of which it had been a part, and became a town. It was incorporated as a city in 1881. Pop. 1920, 49,103; 1930, 58,036.

MALDIVE ISLANDS, archipelago of the Indian Ocean, 400 mi. southwest of Ceylon, consisting of 13 coral islets lying about 400 mi. southwest of Ceylon, of which they are a dependency. They are thickly covered with coconut palms and produce millet and various tropical fruits. The chief exports are tortoiseshell, coir, dried fish, copra and coconuts. The islands are governed by an elected sultan who pays tribute to the Government of Ceylon. The island of Male is the administrative center. Pop. 1921, 71,000.

MALECITE, a North American Indian tribe belonging to the Abnaki division of the Algonkian linguistic stock, but linguistically most closely allied to

the Passamaquoddy. In the 17th century the Malecite lived on the banks of the St. Johns River in New Brunswick, Canada. They intermarried early with the French, from whom they obtained firearms as well as metal tools, and aligned themselves with the French against the English. The remnants of the tribe now live in Quebec and New Brunswick. They are an agricultural as well as a hunting and fishing people, living in conical birchbark or mat-covered houses. They were governed by two councils. They were skilful canoemen, making canoes as well as utensils of birchbark.

MALE FERN (*Dryopteris Filix-mas*), an elegant fern of the true-fern family, useful as a medicinal plant and cultivated as an ornamental. It grows in woods widely throughout the world; in North America ranging from Newfoundland and Greenland to Alaska, southward to Vermont, South Dakota and California. The plant grows 2 or 3 ft. high in a large circular tuft. Male-fern oil, used as a vermifuge, is obtained from the stout rootstock. In cultivation there are varieties with crisped and crested foliage and also dwarf forms. *See also* ASPIDIUM.

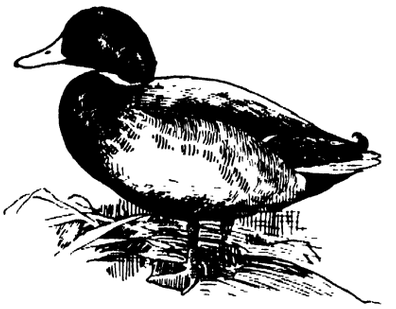
MALHERBE, FRANÇOIS DE (1555-1628), French poet and critic, was born at Caen in 1555. For some time he was in the service of Henri d'Angoulême, grand prior of France. Later he was presented to Henry IV and thenceforward lived at court. His output of poetry was small, but his critical influence on French poetry was considerable. Malherbe has been considered responsible for the diminution of the musical and lyrical in French poetry, qualities which were revived by the Romantics in the early 19th century. He died in Paris, Oct. 16, 1628.

MALICIOUS MISCHIEF, wanton injury to property or persons. It is a COMMON LAW offense, but there are STATUTES on the subject differing in various states. Some statutes limit it to inanimate objects. For example, killing a dog was held not malicious mischief. Generally speaking, however, if the jury finds from the evidence that some person or persons, with malicious intent, injured property or persons, malicious mischief is found and punished. Another example is that of a man who enters an unoccupied locomotive and, in attempting to start it, causes an explosion and damages property.

MALICIOUS PROSECUTION, the institution of legal proceedings without particular cause and maliciously. Where a criminal proceeding is brought in this way, in case the proceeding terminates favorably to the accused, he may have redress through an action for malicious prosecution. How far malicious prosecution at a civil action creates such a liability is in dispute. It is generally held that where the civil proceeding involves seizure of person or property, upon termination favorable to the defendant an action may be maintained.

MALINES or **MICHELEN,** an old city in Belgium, seat of the kingdom's only archbishopric. Formerly celebrated for its lace, Malines is now a center of trade in linen, furniture, needles and oil, and maintains railway machine shops. It has a fine cathedral with an altar-piece by Van Dyck; the churches of Notre Dame and St. John contain paintings by Rubens. In the 14th century Malines was in the possession of the dukes of Burgundy and, 200 years later, suffered greatly during the religious wars. In the World War the town was thrice bombarded. Later it became renowned as the home of the patriot, Cardinal Mercier, Archbishop of Malines and Primate of Belgium, who died in 1926. Pop. 1930, 60,950.

MALLARD (*Anas platyrhynchos*), one of the best known and most widely distributed of wild ducks, and the species from which nearly all the domestic breeds have descended. This fine game bird frequents ponds, streams and marshy places, ranging in summer widely throughout the Northern Hemisphere and wintering southward as far as Egypt, India and Panama. In the New World it breeds from the United States northward to the arctic circle and migrates in winter to the southern states and Central America. The male, about 2 ft. in length, is a remarkably handsome bird, with a glossy green head, white



DRAWING BY GEORGE MIKSCH SUTTON

MALLARD

collar, chestnut-colored breast, violet wing bands and the remainder of the plumage chiefly grayish; the female is smaller with mostly mottled brown and buff plumage. The mallard walks easily, can dive if necessary and flies with great speed. Its food consists chiefly of the seeds of grasses and various other plants, roots, worms, molluscs and insects which it secures by dabbling in shallow water. When startled its cry is a loud, alarmed quack. The mallard nests usually on the ground among reeds and grasses near the water and lays 6 to 13 greenish eggs. It is of first rank among artificially raised aquatic birds, being reared as a wild duck in larger numbers than any other species.

A. B. J.

MALLARMÉ, STÉPHANE (1842-98), French poet, was born in Paris, Mar. 18, 1842. He was professor of English in a French college and made remarkable translations of the works of Edgar Allan Poe. A symbolist, he evolved new theories of aesthetics, and his own poetry, which illustrated them, suffered considerably from obscurity as a consequence. His best known poem, *L'Après-midi d'un faune,* first appeared in 1876, and was later published in the *Poésies Complètes,* 1887. Mallarmé died at Valvins, near Fontainebleau, Sept. 9, 1898.

MALLOPHAGA, the scientific name for a suborder of insects, commonly known as bird-lice. *See also* ANOPLEURA.

MALLORCA. *See* MAJORCA.

MALLOW, a genus (*Malva*) of herbs of the mallow family including several garden ornamentals. There are about 30 species, natives of the Old World, several of which are widely naturalized as weeds in North America. They comprise annual, biennial and perennial plants with variously lobed and cut leaves and rose-colored or white flowers. Among those more commonly planted for their large and showy flowers are the musk mallow (*M. moschata*), the vervain mallow (*M. Alcea*) and the high mallow (*M. sylvestris*). The dwarf mallow (*M. rotundifolia*), a very common weed, is also called cheeses because of its cheese-shaped mucilaginous seed pods.

MALMÖ, a city in southern Sweden, the country's third port and after Stockholm its most important industrial center. A commercial metropolis in the Middle Ages, Malmö later became less prosperous, but has regained its position since the 18th century. It is the chief Swedish station on the Stockholm-Berlin railway and has regular ferry service for both vehicles and trains to Copenhagen, Denmark. It is also an important airport, being the terminus of the Scandinavian air express from London and Paris. Malmö has shipbuilding yards and varied factories; its chief exports are matches, grain and dairy products. Pop. 1931, 127,222.

MALONE, a village in northeastern New York, the county seat of Franklin Co., situated on Salmon River, 59 mi. northeast of Ogdensburg, near the Canadian border. It is served by two railroads. Malone is an industrial community having paper, pulp and lumber mills and various factories. Situated in the beautiful northern foothills of the Adirondacks, it is a gateway to the great north woods. On two occasions it was a rendezvous for the Fenians, an Irish secret revolutionary society of the 19th century. Malone was founded about 1805 and received its present name in 1812. The village was incorporated in 1853. Pop. 1920, 7,556; 1930, 8,657.

MALORY, SIR THOMAS (c. 1430-c. 1471), author of *Morte d'Arthur,* the first outstanding English prose romance. Information regarding his life is virtually nonexistent, beyond the facts that he was a knight and that his book was completed within the first 10 years of Edward IV's reign. MORTE D'ARTHUR is a compilation of the romances and legends dealing with King Arthur and the knights of his ROUND TABLE. (*See also* ARTHURIAN LEGENDS.) Malory undoubtedly gathered his material chiefly from 12th century French sources and from an English poem of the 14th century known as *Morte Arthur.* The Manuscript of *Morte d'Arthur* was intrusted to WILLIAM CAXTON, who divided it into books and chapters and printed it in 1485. *See also* ENGLISH LITERATURE.

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MALPIGHI, MARCELLO (1628-1694), Italian microscopist, born March 10, 1628, in Crevalcuore, near Bologna. He graduated in medicine in 1653, and became professor of anatomy at Bologna, Pisa and Messina. Famed in biology for his works on the anatomy of the silkworm and the morphology of plants, he made an epoch in medicine by his investigations of the embryology of the chick and the histology and physiology of the glands and viscera. Of his discovery of the capillaries (1660), Fraser Harris said: "Harvey made their existence a logical necessity; Malpighi made it a histological certainty." Malpighi described the red blood corpuscles in 1665. He discovered the rete mucosum or Malpighian layer of skin, and proved that the papillae of the tongue are organs of taste. His greatest work is perhaps the *De Pulmonibus* (1661), which overthrew the current conceptions of pulmonary tissues. The name of Malpighi is still associated, in addition to the Malpighian layer of skin, with the vascular coils in the cortex of the kidney and with the follicular bodies in the spleen. Malpighi died of apoplexy in Rome on November 30, 1694. M. F.

MALPLAQUET, BATTLE OF, an engagement at the village of Malplaquet, in northeastern France, on Sept. 11, 1709, between the English, Dutch, and Prussian armies under the Duke of Marlborough and Prince Eugene and the French under Marshal Villars. The forces, numbering more than 90,000 on each side, camped near one another for two days before the attack. At the beginning of the battle the Allies were unable to drive back the French, and the latter inflicted great casualties on their enemies. The defeat of the left wing by a flank movement caused the French center and right to give way, and the final struggle between the two cavalry bodies gave the Allies the victory. In casualties the Allies lost approximately 20,000 men, while the French lost only about 12,000. Malplaquet was the last great battle of the WAR OF THE SPANISH SUCCESSION.

MALTA, a British island in the Mediterranean, lying about 60 mi. south of Sicily and about 200 mi. from the northern coast of Africa. It is somewhat oval in shape and of irregular coastline. Its length is 17 mi., its greatest breadth 9 mi., and its area 95 sq. mi. The highest point of land is 850 ft. above the sea. The island, however, occupies a central position in the Mediterranean and is an important port of call. Farming is the principal industry and the agricultural products include wheat, barley, potatoes and cotton. Fruits, particularly figs, lemons and oranges, thrive abundantly and are of an excellent quality. Olives and grapes are also cultivated. Potatoes, hides and skins and onions are the chief exports, while the imports include wheat, sugar, coal, flour, textiles and wines. The value of the imports, however, exceeds the value of the exports six to one. In 1928, for example, the exports amounted to £556,908, while the imports represented a total value of nearly £4,000,000. The trade is almost entirely with Great Britain.

After being held by Phoenicians, Greeks, Carthagin-

ians and Romans, in 870 Malta was occupied by the Arabs. Later it was joined to Sicily, but in 1530 was given to the Knights of St. John (Knights of Malta) who ruled it until 1798, when the island was surrendered to Napoleon. The British immediately blockaded Malta and two years later occupied it, but it was not formally ceded to them until the Treaty of Paris in 1814. Since then it has been a British possession and is used as the base for the British fleet in the Mediterranean. It is governed by a British governor and commander in chief, who is assisted by an executive and a nominated council. The legislature consists of a senate and an assembly, the former being composed of 17 members and the latter of 32. Valletta is the capital. Pop. 1928, 230,618, exclusive of the military.

MALTESE CROSS, in botany, a hairy perennial (*Lychnis chalcedonica*) of the PINK family, native to Russia and Siberia and widely cultivated for ornament. It is a showy border plant, 2 to 3 ft. tall, of easy culture and pleasing habit, bearing brilliant scarlet flowers an inch across in dense heads. The petals are notched like the arms of a Maltese cross, hence the name.

MALTHUS, THOMAS ROBERT (1766-1834), British economist, was born near Guildford, Surrey, Feb. 17, 1766. In 1798 he published the first edition of his celebrated *Essay on Population* exposing in this work the disproportionate increase of population in ratio to subsistence, and predicting the evils of overpopulation. Five years later he published an enlarged and revised edition, in which he urged the limitation of the birth rate by "moral restraint." Four later editions of the book were published during the author's lifetime, and its influence on subsequent thought can scarcely be overestimated. Malthus was appointed in 1805 professor of history and political economy in the East India Company's College at Haileybury. He is believed to have been the first writer to enunciate the law of diminishing returns in relation to agriculture. He died at Haileybury, Dec. 23, 1834.

MALTHUSIANISM, a theory of social economy which asserts that it is the universal tendency for population to increase more rapidly than means of subsistence, expounded by THOMAS ROBERT MALTHUS. According to Malthusianism, the increase of population should be regulated by moral restraint (deferred marriage) to keep the population from pressing upon means of subsistence and thereby eliminate the operation of vice, misery and other natural checks.

Malthus published the first edition of his *Essay on the Principles of Population* in 1798, putting forth the theory that population increased according to a geometrical ratio (1, 2, 4, 8, 16, and so on) while means of subsistence can be made to increase only according to an arithmetical ratio (1, 2, 3, 4, 5, and so on). He asserted that the future of mankind would necessarily be an unhappy one since POPULATION would always press upon the means of subsistence and would be prevented from exceeding that limit by the positive checks of famine, pestilence and war, accompanied by misery and vice. In answer to a storm of sharp controversy over his theories Malthus published a second edition of the *Essay* in 1803. This was a very scholarly treatise. In it he largely disregarded his mathematical theory and introduced the principle that the rate of increase in population is also reduced by preventive checks. In later editions of his work, six being published in all, Malthus recognized the principle that means of subsistence includes more than the bare necessities of life.

It may be generally stated that Malthusianism still holds in the Orient, but is out of date in the West, although it has come to its own somewhat since the World War. The increased productivity of the soil and factories as effected by the machine age, the development of transportation facilities and increased colonization and BIRTH CONTROL have worked together to prevent Malthus' conclusions from being realized.

MALTOSE, a common sugar obtained naturally by the malting or germinating of grain. It is formed in the degradation of starch either by acids or by enzymes. On further treatment with acids or with certain other enzymes, each molecule of maltose is converted to two molecules of GLUCOSE. Weight for weight, maltose is not as sweet as SUCROSE.

The original description of enzyme action by Kirchhoff, in 1814, was based upon his discovery of the conversion of STARCH to maltose and included a description of this sugar, whereby it was differentiated from glucose or grape sugar for the first time. The synthesis of maltose is a modern contribution credited to the Swiss chemists, Pictet and Vogel, in 1927.

R. P. W.

MALUS, ÉTIENNE LOUIS (1775-1812), French physicist, was born at Paris, June 23, 1775. Trained as a military engineer, he was engaged in the fortifications of Strassburg in 1806. Two years later he returned to Paris as examiner at the École Polytechnique where he made his discovery of the polarization of light. He proposed a theory to account for double refraction, described in a paper, *Théorie de la double refraction de la lumière dans les substances cristallines,* read to the Institute of France in 1810. Malus died at Paris, Feb. 23, 1812.

MALVERN, an urban district and inland watering place of Worcestershire, England, beautifully situated 128 mi. northwest of London. The name to-day applies collectively to a series of six towns. The principal one, Great Malvern, boasts the scant ruins of a Benedictine priory (1083) which is the supposed school of William Langland, author of *The Vision of Piers the Plowman.* A dramatic festival in which George Bernard Shaw's work largely figures is held annually in August. Pop. 1921, 17,812; 1931, 15,632.

MALVERN, a city and the county seat of Hot Spring Co., in southwestern Arkansas, situated 45 mi. southwest of Little Rock. Bus lines and two railroads serve the city. Cotton and corn are the chief crops of

the vicinity. The principal industries include the manufacture of clay and lumber products and cloth. The points of interest near the city are the Hot Springs, Magnet Cove, Remmel Dam and Lake Catherine. The city was founded in 1879 and incorporated in 1885. Pop. 1920, 3,864; 1930, 5,115.

MALVERN HILL, BATTLE OF, July 1, 1862, the last and most notable of the SEVEN DAYS' BATTLES, a series of engagements of the CIVIL WAR.

MALVERN HILLS, a chain of hills 9 mi. long in Worcestershire, England, rising from the valley of the Severn, the highest point being about 1,390 ft. This region was formerly heavily forested and belonged to the Crown. A large number of mineral wells has made the Malvern Hills a health resort.

MALVY, LOUIS JEAN (1875-), French radical Socialist, was born Dec. 1, 1875 at Figeac. A lawyer by profession, he held offices as minister of finance and of commerce. In 1918 the Senate adjudged him guilty of pacifism during his ministry 1914 to 1917 and banished him for five years. However from 1924 onward Malvy was again in the Chamber and in 1928 was elected chairman of the finance committee.

MAMARONECK, a village and residential suburb in Westchester Co., situated on Long Island Sound, N.Y., 20 mi. northeast of New York City. The New Haven and the New York, Westchester and Boston railroads afford transportation. The retail business in 1929 amounted to $6,810,802. The site of the village, on the Boston Post Road, was included in the tract which John Richbell purchased from the Indians in 1661. It was settled by members of the Richbell family in 1676; incorporated as a village in 1895. A skirmish of the American Revolution took place here on Oct. 21, 1776. Adjoining the village is Saxon Woods Park, a county park of 800 acres attractive to hikers, equestrians and golfers. Pop. 1920, 6,571; 1930, 11,766.

MAMBA, an African relative of the cobra that enjoys a reputation for being unsurpassed in ferocity among snakes. The mambas (*Dendraspis*) are characterized by a long, narrow head, slender body, long tail and scales arranged obliquely. They are arboreal in habits and eat small mammals and birds. The maximum size attained by these snakes is about 13 ft.

MAMELUKES, the palace troops established in 1238 by the Sultan of Egypt, Malik al Salih. The troops were usually slaves recruited for the purpose. Having no fixed interests in Egypt, they soon came to play the rôle of the Praetorian Guards at Rome, making and unmaking sultans at their pleasure. From this fact the name came to apply to these sultans. The dominion of the Mamelukes was destroyed by the Turkish conquest of Egypt by Selim I in 1515. *See* JANISSARIES.

MAMMALS (*Mammalia*), the class of animals which possess breasts or mammary glands that, in the females, give forth a milky secretion for the nourishment of the young. Except in the case of the primitive monotremes, which lay eggs, the young are born alive. Hair or fur is a distinctive mammalian feature. It has been greatly modified to form, by coalescence, such structures as pigs' bristles, the horn of the rhinoceros, the pangolin's scales, and the armor of the armadillo. A few mammals are relatively hairless, but even whales have bristles on the lip, and have a hairy coat before birth.

There is little doubt that mammals were derived from the mammal-like reptiles of early Mesozoic times. In that era, while the gigantic reptiles were roaming the earth, mammals were probably very small and insignificant creatures. During the Cenozoic period they became, and have since remained, the dominant animals of the land. The phenomenal brain development of man has given him amazing control of earth, air, and water.

It is important to notice the advantages of mammals over reptiles, which worked for the final triumph of the former. As the young mammals are born alive the egg is never left defenseless for some enemy to eat. Further, there is a long period of maternal care. Then mammals are warm-blooded. They can keep their temperature constant in normal heat or cold. In this their fur coats help by cutting down the radiation of the body heat, or protecting them from the sun's rays. And finally, the nervous system of mammals is highly developed.

Mammals have become adapted to life in almost every environment. The horse is terrestrial; the mole, a digger; whales and seals are aquatic; monkeys live in trees; bats have wings and fly.

There are about 2,700 species of living mammals, which may be classified in 18 orders as follows:

Prototheria—Egg laying mammals.
1. Monotremata—The duck-billed platypus and spiny ant-eaters.

Eutheria—Mammals which bear their young alive.
Didelphia—Mammals which usually have a marsupial pouch.
2. Marsupialia—Marsupials, as the kangaroo or opossum.

Monodelphia—Placental mammals.
3. Insectivora—Insectivores: hedgehogs, moles, and shrews.
4. Dermoptera—The flying lemur.
5. Chiroptera—Bats.
6. Carnivora—Carnivores as cats, wolves, seals.
7. Rodentia—Rodents, as mice, squirrels and hares.
8. Edentata—Sloths, armadillos and ant-bears.
9. Pholidota—Pangolins or scaly ant-eaters.
10. Tubulidentata—The aard-vark.
11. Primates—Lemurs, monkeys, apes and man.
12. Artiodactyla—Even-toed hoofed mammals, as pigs, sheep, deer, camels.
13. Perissodactyla—Odd-toed hoofed mammals: horses, tapirs, rhinoceroses.
14. Proboscidia—Elephants.
15. Sirenia—Dugongs and manatees.

16. Hyracoidea—Hyraxes.
17. Odontoceti—Toothed whales.
18. Mystacoceti—Whalebone whales.

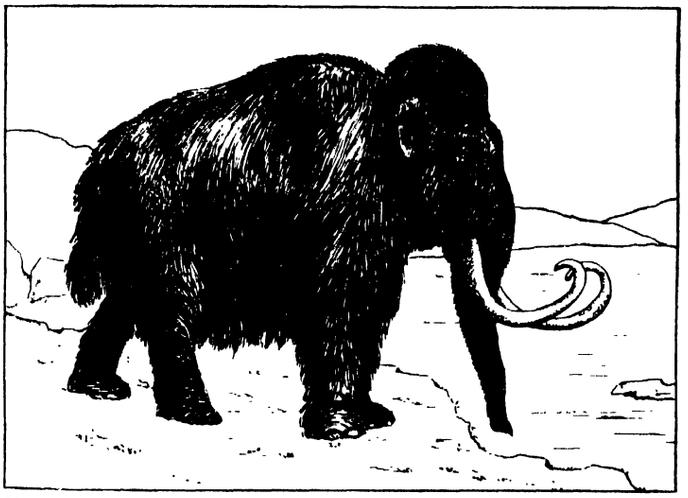
See also ANIMALS; ZOOLOGY. A. I. W.

MAMMEE-APPLE (*Mammea americana*), a tall compact tree of the garcinia family called also mamey. It is a native of the West Indies and northern South America, cultivated in tropical countries for its edible fruit. The tree, which sometimes grows 60 ft. high, bears glossy, leathery leaves; showy fragrant white flowers and large stone fruits, 4 to 6 in. in diameter, with a rough reddish-brown rind surrounding a yellow flesh. The fruit is eaten fresh or made into preserves. A liquor is distilled from the flowers.

MAMMOTH, a primitive hairy elephant, best known of extinct animals. To the evidence of bones, teeth, and tusks, numerously brought to light in northern countries, and lifelike portraits drawn by contemporary cave-artists of the Old Stone Age, has been added a series of cold storage specimens recovered from the frozen Siberian tundras, with flesh, skin, and hair, intact, and so fresh that bears and dogs devoured the meat.

These animals stood about 9 ft. high, were clothed in long black hair over an undercoat of reddish brown wool, had high, pointed heads, and a hump on the back of the neck. The tusks were strongly curved upward and outward, averaged 8-10 ft. long, and weighed about 150 lbs.

The true northern mammoth (*Elephas primigenius*) ranged from Alaska southward to the latitude



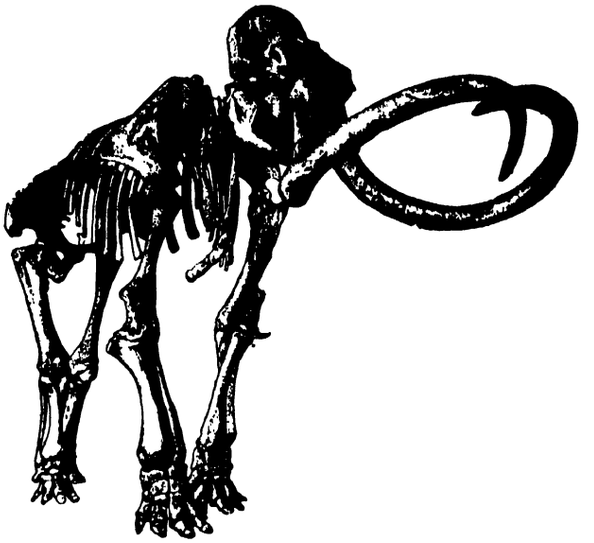
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WOOLLY MAMMOTH OF NORTHERN SIBERIA (*Elephas primigenius*). *From a painting by Charles R. Knight*

of Washington, D.C. In central United States this species was replaced by the imperial mammoth, standing over 13 ft. high, and in the southwest by the smaller Columbian mammoth.

The discovery in 1927 at Vero, Fla., of human skeletons in apparently undisturbed strata containing remains of the Columbian mammoth, has gone far to establish scientific certainty that in North America as in Europe, the mammoth and man were contemporary.

Extinct for ages, mammoths retain up-to-date economic importance through survival of the ancient trade in their tusks obtained chiefly in arctic Siberia. These furnish about half of the output of commercial



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COLUMBIAN MAMMOTH (*Elephas columbi*), SKELETON

ivory. Before Soviet days Siberia exported about 100 tons of fossil ivory every year.

MAMMOTH CAVE, one of the largest known caverns in the world, situated in Edmonson Co., central Kentucky, about 100 mi. south of Louisville. The cave underlies an area 10 mi. in diameter but the aggregate distance through the main cave and tributary systems of caves, domes, chambers and passageways on various levels totals at least 150 mi. St. Louis limestone of horizontal stratification, in places over 300 ft. thick, forms the material from which the cave has been carved by underground tributaries of the Green River. The limestone is capped by a layer of Chester sandstone which is perforated with hundreds of sink-holes. An arch with a span of 70 ft. forms the entrance to the cave ½ mi. from the Green River and 194 ft. above the level of the river. A hunter by the name of Hutchins is said to have discovered the cave when he chased a bear into its entrance but county records of 1797 give strong evidence that it was known at an earlier date. The charted portion of the cave includes 225 avenues, 47 domes, 23 pits, 8 cataracts, 3 rivers, 2 lakes, 1 sea and innumerable streams and pools. The largest of the so-called domes is Chief City. This is a cavern 450 ft. long by 130 ft. wide where Indian chiefs were wont to smoke the calumet by the light of flambeaux and faggot fires. Other large domes averaging 250 ft. in height are known as Stella, Mammoth and Gorin. Larger bodies of water are the Dead Sea, a pool 100 ft. long and walled by cliffs 60 ft. in height; Lethe Lake with walls 90 ft. high; the River Styx, 40 ft. long and spanned by a natural bridge; and Echo River, a stream or pool ¾ mi. long and famous for the

resonance of the tones which it produces. Two species of blind fish and also blind and colorless crayfish have been found in waters of the cave. The most interesting inhabitants are blind and wingless grasshoppers. The temperature in the cave remains almost constantly at 54° and the air is fresh and pure. The cave is accessible to the public.

MAMO, a remarkable bird (*Drepanis pacifica*) of the Hawaiian honeycreeper family, believed to have become extinct about 1900. It was nearly 8 in. long, with a slender curved bill and glossy black plumage marked with patches of brilliant yellow. Never abundant, its complete destruction is thought to have been brought about by the use of its resplendent yellow feathers to ornament the official robes of Hawaiian chiefs.

MAN, ISLE OF, a British possession situated in the Irish Sea about midway between England, Scotland and Ireland. Area 220 sq. mi., length 33 mi., and extreme breadth 12 mi. Pop. 1921, 60,284; 1931, 49,338 including visitors.

The southern section is mainly composed of rocks of Cambrian age and is hilly or undulating, with rocky cliffs as coasts. The northern portion, about one-fourth of the whole, is composed of flat alluvium. Snaefell has an altitude of 2,034 ft. The most populous towns, Douglas, Ramsey and Peel, owe the greater part of their population to their attractions as summer resorts. Herring, mackerel and other fisheries are important. Almost 60% of the whole island is cultivated, oats being the principal crop. The leading manufactures are blankets, fishing nets and hemp ropes. Brewing is a prosperous industry, but the tourist traffic, with its immense annual influx of visitors is of the greatest economic importance. Excellent steamers serve the island from Liverpool, Glasgow, Belfast and Dublin, and much is made of the natural beauty of the glens and the remarkable flowers. The principal educational institution is King William's College, Castletown.

The Isle of Man has no representation in the imperial parliament, and is almost entirely self-governing. After many political changes, it was purchased from the Duke of Atholl by the English crown in 1827. The administration is vested in the Court of Tynwald, composed of a number of crown nominees, and a representative body called the House of Keys, which has the legislative powers for the island.

MANAGEMENT. *See* INDUSTRIAL MANAGEMENT; SCIENTIFIC MANAGEMENT.

MANAGEMENT ENGINEER, an engineer who develops and installs methods for the operation of industry, i.e. methods of running machines and equipment and using human energy and brains to eliminate waste and secure the best results both for workers and owners from expenditure of energy and capital. His field differs from that of the engineer, who by research develops knowledge of processes and of construction of machines and equipment. The management engineer applies methods of using that knowledge and those machines.

Such methods cover: plant layout, planning and scheduling, idleness records, stores keeping, time and motion study, elimination of fatigue, incentive payments, cost keeping, sales organization, financial budgeting and executive control. For the installation of these the management engineer develops and applies a technic of analyzing conditions, simplifying problems and presenting facts so clearly that the average man can understand what action should be taken. He must be able to work with all kinds of men and to get them to work together, for he can accomplish results only through men's minds.

Management engineering is developing beyond the purely mechanistic phases of increasing production and lowering costs to the relation of these things to human welfare and the best interests of mankind.

The theoretical training for this profession is taught in leading universities. Practice should be gained under experienced engineers. Among societies of management engineers in America are: American Society of Mechanical Engineers, Taylor Society, American Management Associations, Society of Industrial Engineers.

The opportunities for the application of science to management are broadening, not only in plants and offices, but in groups of plants, entire industries, in agriculture, commerce, other phases of business, in governments and international fields. W. C.

MANAGUA, the capital of NICARAGUA and the department of Managua. It lies on the south shore of Lake Managua, 87 mi. from the port of Corinto.

Managua is a very dusty city, covered with fine volcanic ash from nearby Momotombo, an overtopping peak with a little wreath of smoke about its head. This wreath is rosy and luminous at night. There are some good stores, almost invariably financed and managed by foreigners; and a number of two-story, well-constructed, balconied private dwellings, of which the most imposing is that built by President Zelaya for family use. This house was taken for the use of Nicaraguan presidents after 1912, when United States marines housed themselves in the official residence, the National Palace. Another fine house belonging to the family of the historian Gamez was later used as an American legation. The market in Managua is noted for woven articles, basketwork, carved gourds and superb Nicaraguan fruit. The cathedral is of mud bricks, like practically every other building in the city, and is lined with wood, painted pale blue.

In 1852 Managua, then a sleepy agricultural community, was made the seat of government. Formerly Leon and Granada were each able to claim ascendancy from time to time as one party or another called it the capital. Nicaragua was at that period a member of the Federation of Central America, and was ruled by a "Dictator." In 1854 the city accepted the separate status of a republic. Managua has known little respite from political troubles; but these were as nothing compared with the earthquake of Mar. 31, 1931, which completely destroyed the

city and caused a loss in life estimated at over 2,000. Est. pop. 1929, 50,000.

MANAGUA, LAKE, a body of water situated in western NICARAGUA at an elevation of 154 ft. above sea level. It is about 32 mi. long, has an average width of 16 mi. and a water surface of about 560 sq. mi. The average depth is 30 ft. This lake has but a slight inflow which is mostly carried away by evaporation, and it has no outlet except at times of high water when it communicates by the Tipitapa emissary across the intervening ridge to Lake Nicaragua, a much larger body of water to the south. This outlet is 16 mi. long with a fall of 7 or 8 in. per mi. During the rainy season it is 6 to 12 ft. deep, at other times, quite dry. The city of MANAGUA is situated on the shores of Managua Lake.

MAN AND SUPERMAN, a brilliant comedy of ideas by GEORGE BERNARD SHAW, first produced in 1905, presenting a modernized version of the Don Juan motive. The action turns on the efforts of John Tanner, an attractive social revolutionist, to escape the bonds of love and marriage, efforts which ultimately fail before the determined pursuit of the charming Ann Whitefield. The play sparkles with wit and paradox, and includes a delightful parody on the romantic conception of Spanish brigands.

MANÁOS, a city of Brazil, capital of the state of Amazonas, situated on the Negro River, 10 mi. from its mouth in the Amazon. It is reached by large vessels via the Amazon and is the principal port and trading center of the upper Amazon region. Manáos contains several important educational institutions, among them a lyceum, an orphanage, an industrial school and a chemical institute. There is a fine botanical garden, a museum, a cathedral and a public library. The principal articles of export are rubber, cacao, hides, horns, dried fish and nuts. Manáos was founded in about the middle of the 17th century as a small fort. The capital of the state of Amazonas, it is also the seat of an episcopal see. Pop. 1920, 75,704; est. pop. 1930, 83,736.

MANASSAS, BATTLE OF. *See* BULL RUN, OR MANASSAS, BATTLE OF.

MANASSEH BEN ISRAEL (1604-57), versatile Dutch Jewish savant, statesman, author and rabbi, of Marrano descent, was born in Lisbon, Portugal, in 1604, and died at Middelburg, Holland, in 1657. He was a profound believer in the inspired truth of the Talmud and of the Zohar, the text-book of Cabala.

Influenced by the views of contemporary Messianic visionaries, and convinced on the ground of his mystical beliefs and inclinations, Manasseh believed that the Messianic promise of the return of the Jews to Palestine was due to be fulfilled soon. He declared, however, in his work, *Esperança de Israel,* or *The Hope of Israel,* in 1650, that the fulfillment of this prophecy would not be able to take place until the Jews had been scattered to all parts of the world. The Jews would, therefore, have to be readmitted to England. This work of his, containing an introduction addressed to the English Parliament, attracted the attention of Oliver Cromwell, who, an advocate of the unconditional toleration of all religions, negotiated with Manasseh for the readmission of the Jews to England, and invited him to visit England in 1655. In answer to those who opposed the readmission of the Jews, Manasseh wrote his *Vindiciae Judaeorum,* or *Vindication of the Jews,* in 1656. With Cromwell's tacit approval, Manasseh's purpose was gradually consummated; Jews were permitted to reenter England and within the succeeding decade, fairly large numbers of them were again living there. Cromwell himself granted Manasseh ben Israel a yearly pension of £100 out of the public treasury. However, since he died only a few months after it had been granted to him he never enjoyed it. A. SH.

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MANATEE, an animal of the order *Sirenia* called also sea-cow. The American manatee and the oriental dugongs constitute an order of large aquatic mammals, living on weedy seashores and in estuaries. They are sometimes 12 ft. long, have a clumsy, heavy body, whale-like in shape and in the absence of hind limbs and also in having pectoral flippers and a horizontal tail. The skin, which is almost naked, is of a dark hue. The head is indistinct, with a muzzle, broad and pendulous lips which are cleft above; small eyes, no external ears; many grinding teeth. They are harmless, sluggish creatures; spend their lives in shallow water, salt and fresh, continually feeding on aquatic vegetation. The manatee is still found in southern Florida and in the West Indies, but has been nearly exterminated for the sake of its thick hide, oil and flesh. The closely similar dugong, or halicone, remains numerous in the East Indies and about northern Australia; a related species inhabits the western coast of Africa. E. I.

MANCHESTER, city and and county borough in Lancashire, England, on the Irwell, Irk and Medlock Rivers. The inner city between the Irwell and Medlock, the business district, has straight though narrow streets, and the outlying districts and suburbs are well-built residential sections, though the suburbs also contain large factories. The working people live mostly in Salford across the Irwell. Among the churches are the cathedral of the 14th century, later restored, All Saints', St. Mary's, St. George's and St. Peter's. Of the secular buildings the most noteworthy are the Royal Hospital, 1752, stock exchange, 1869, town hall, 1877, University, free trade hall, 1856, art gallery, municipal art school, general postoffice and the crematory. There are monuments of Wellington, Dalton, James Watt, Robert Peel, Cromwell, Prince Albert and Queen Victoria. Of the parks and squares, more than 70 in number, the finest are Queen's, Heaton, Platt, Alexandra and Manly Parks and Albert Square.

Manchester's trade is based upon the Lancashire coal and importation of transatlantic raw materials. It is the center of the British cotton industry and

has also bleaching and dyeing plants, calico printing, and produces, besides machinery, tools, chemicals, paint, and woolen, silk and rubber goods. The trade is aided by a cotton exchange, a branch of the Bank of England, a clearing house and a chamber of commerce. The harbor has eight docks on the Manchester Ship Canal, which was deepened in 1925. The city is also an important railroad center, especially for the traffic with Scotland. The passenger traffic is served by 9 stations which are interconnected. There is also an airport.

Besides the Victoria University, founded in 1880, Manchester has advanced schools, technical and vocational schools, college of music and teachers' seminary, a branch of the London Geological Institute, botanical and zoological gardens, 10 learned societies, art gallery, museums, and a broadcasting station.

Manchester, the *Mancanium* of the Romans, was mentioned in the Doomsday-book. The rights of the Lord of the Manor were granted by William the Conqueror to Roger of Poitou and passed successively to various other families, among them the De la Warres, until the municipality purchased them in 1845. Its growth and affluence are due to its industrial enterprises. Its manufactures of woolen and linen goods in early times made it the most populous city in Lancashire by 1558 and its modern growth began with the cotton industry. Pop. 1921, 735,774; 1931, 766,333.

MANCHESTER, a large textile manufacturing city in southern New Hampshire, the county seat of Hillsborough Co., situated on the Merrimac River, 55 mi. northwest of Boston. Bus lines and the Boston and Maine Railroad afford transportation. There is an excellent airport. The countryside produces fruit, especially apples. Scotch-Irish settlers came here about 1722-23. Judge Samuel Blodgett was the first to realize the industrial power of the waterfall; the building of the canal around the falls was due to his foresight. This, in 1807, made a waterway to Boston. Judge Blodgett also erected here the first local cotton mill, in 1805. To-day the Amoskeag Manufacturing Co. is one of the world's largest textile producing plants. Shoes and cigars are also important manufactures. In 1929 the factory output was valued approximately at $85,000,000; the retail trade amounted to $36,744,398. Manchester became a city in 1846. Pop. 1920, 78,384; 1930, 76,834.

MANCHESTER, UNIVERSITY OF (The Victoria University of Manchester), a coeducational university, situated at Manchester, England. It is an outgrowth of Owens College, which was founded by a local merchant, John Owens, in 1846 and opened in 1851. In 1880 this college was incorporated with the College of Science, at Leeds, and University College (now the UNIVERSITY OF LIVERPOOL), at Liverpool, to form a university. The three colleges were separated, however, in 1903, and the University of Manchester was reconstituted to include, as originally, Owens College. The present university has faculties of arts, science, medicine, law, theology, commerce, technology, education and music, and enrolls annually about 2,800 students. Conspicuous among its buildings are Whitworth Hall, the Manchester Museum and the Christie Library, which contains 190,000 volumes. In 1930 the faculty of 49, exclusive of lecturers and assistants, was headed by the Rt. Hon. the Earl of Crawford and Balcarres.

MANCHESTER SCHOOL, the stronghold of extreme liberalism both in the practical and theoretical ECONOMICS of 19th century England, and therefore the focal point of the reaction against classical individualism. This group, made up largely of wealthy Manchester manufacturers, carried the LAISSEZ-FAIRE principles set forth by ADAM SMITH and DAVID RICARDO, to practical lengths not contemplated by their authors. Perhaps because of their experience with the cotton industry unrestricted by the older guild regulations (*see* GUILDS), these industrialists advocated free competition, unrestrained by any government interference whatever. This, they claim, was the road to individual and national wealth; not only free competition within a nation, but FREE TRADE without. By this latter principle they became associated with the agitation against the CORN LAWS, which RICHARD COBDEN and JOHN BRIGHT had concentrated in the Anti-Corn Law League.

This school, which attained political importance in England through the corn law controversy and the subsequent repeal of the corn laws, also had considerable influence upon Continental thought. Bastiat, with his social harmony automatically resulting from complete individual freedom, had much in common with Cobden. In Germany, Manchestertum symbolised all that was distasteful in the individualism of classical economics. Actually the Manchester School did not typify classical economics, but merely embodied the extreme application of certain classical principles, isolated from their modifying context. *See also* CLASSICAL SCHOOL OF ECONOMICS. E. W. G.

MANCHESTER SHIP CANAL, in England, a canal, converting Manchester into a seaport. Beginning at Trafford Bridge in Manchester, it runs along the side of the Irwell and bordering the bank of the Mersey estuary from Runcorn, cutting into the land, terminates at Eastham, 6 mi. from Liverpool covering a distance of 35½ mi. At the Manchester extremity, eight docks with a water surface of 120 acres have been provided; at Eastham three locks control the water-level of the canal. Alterations made in 1927 consisted in deepening the portion of the waterway from Eastham locks to Gowy River and the approach channel to Eastham. The minimum depth of the canal is 26 ft., the minimum bottom width 120 ft. The tidal locks at Eastham, with a 16½ ft. lift, are so situated as to enable vessels to pass in and out of the canal at about half-tide. At Latchford, Irlam and Barton there are sets of locks of diverse sizes dividing the waterway into four lengths. Besides saving water by lockage, the canal is able to accommodate a large variety of vessels. About seven hours are required to travel from one extremity of the

canal to the other. Work on the canal was begun in 1887 and completed seven years later at a cost of $77,500,000. The increase in the industrial and commercial activity of Manchester since its opening has been enormous.

MANCHURIA, the northeastern section of China comprising the three provinces of Liaoning (formerly Fengtien), Kirin and Heilungkiang (sometimes called Amur), usually called the Three Eastern Provinces by the Chinese. The region derives its foreign name from the fact that it was the home of the Manchu tribesmen (*see* MANCHUS) who established the Manchu dynasty, which ruled over China from 1644 to 1912. CHOSEN lies on the southeast, Siberia on the northeast, north and northwest, MONGOLIA on the west, China on the southwest and the Gulf of Peichihli on the south. The AMUR RIVER flows along the northern boundary and the Ussuri along the northeastern. The Yalu River separates Chosen and Manchuria. The Liao River in South Manchuria, and the Nonni River-Sungari River system in North Manchuria are the principal rivers. Manchuria frequently is referred to as divided into North and South. Geographically, this division is based on the fact that a range of hills crosses the great central plain in an east-west direction, roughly a little south of the middle, forming the divide between the Liao River and the Nonni-Sungari system. Economically, the division rests on the fact that the trade outlet for South Manchuria is through the ports on the Gulf of Peichihli, and that for North Manchuria is through Russian territory. Politically, the division is between the region where Japanese influence is strong (South Manchuria) and that where Russia holds important interests.

Manchuria is laid out in the form, roughly, of a huge horseshoe, with the opening to the south. Mountain ranges make the sides of the horseshoe, within which lies the great central plain. The mountains are, in the main, heavily forested with trees of varieties roughly comparable to those in corresponding latitudes in North America. The forests abound in fur-bearing animals. Manchuria is comparatively rich in mineral deposits, including coal, iron, oil, gold, lead, zinc, antimony, zechstein and others. No careful study of the mineral resources of the whole area has yet been made. The soil of the plains is exceptionally rich, and the climate in general is excellent for agriculture.

The total area of Manchuria is approximately 380,000 sq. mi., though no accurate survey has been made. Of this perhaps a third is suitable for agriculture. The cultivated area in 1930 was about 50,500 sq. mi., which was an increase of 22,700 sq. mi. or 82% in the last ten years. The areas of the provinces are: Liaoning, 90,000 sq. mi.; Kirin, 80,000 sq. mi.; Heilunghiang, 210,000 sq. mi.

Agriculture. The most important agricultural crop of Manchuria is soya beans. Kaoliang or sorghum, millet, wheat, maize and other cereals, including some rice, also are grown. The production of beans on a large scale has been developed in relatively recent years, and now Manchuria produces between 55% and 60% of the total soya bean crop of the world. Beans, bean cakes and bean oil form by far the most important items of Manchurian exports. Japan takes a substantial part of these exports. The kaoliang is chiefly consumed in Manchuria for food and animal fodder as well as for brewing spirits. Large quantities of millet are exported to Chosen, where rice is grown for export to Japan. In recent years there has been a rapid increase in the production of wheat, especially in the newly-settled areas in North Manchuria. Rice production is increasing rapidly, chiefly at the hands of Chosenese in East Manchuria. Some cotton is being grown in South Manchuria, though the cotton production has not yet reached important dimensions. Agricultural production totalled about 18,000,000 metric tons in 1930, as compared with about 10,000,000 metric tons in 1920.

Industry. Industries in Manchuria include, besides those connected with the production of bean oil and bean cakes, flour milling, cotton spinning and weaving (using imported cotton chiefly), tobacco manufacturing, silk weaving (using local wild silk) and a wide variety of manufacturing connected with coal and iron mining. The Japanese have played the leading rôle in the development of industry in Manchuria, particularly in connection with coal and iron mining and the manufacture of iron products.

History. After the Manchu tribesmen established themselves as the rulers of China (1644), they made an attempt to exclude Chinese settlers from Manchuria. In this they were only partially successful. Beginning in the early part of the 19th century, a small but steadily increasing stream of Chinese migrants flowed into the area. With the completion in 1903 of the CHINESE EASTERN RAILWAY under Russian control and the subsequent improvement in transportation facilities, the number of Chinese immigrants increased rapidly. Following the acquisition by the Japanese of the southern portion of this railway, as a result of the RUSSO-JAPANESE WAR in 1904-5 and because of the construction of considerable additional railway mileage, especially in recent years, the number of immigrants still further increased. In the last five years, the incoming Chinese have numbered approximately a million annually, of whom about half have remained as settlers, the others returning to their homes in North China during the winter months. These settlers have pushed out into the unoccupied plains areas, engaging chiefly in farming.

Since the end of the 19th century, Manchuria has been the field of serious international rivalry between the Chinese, Japanese and Russians. Japan secured from China, as a result of the Sino-Japanese War (1894-5) the cession of the LIAOTUNG PENINSULA. At the demand of Russia, France and Germany Japan gave up this territory. In 1896 Russia secured the right to build a railway, the Chinese Eastern Railway, across North Manchuria, forming a

direct link between the Trans-Siberian Railway and the port of Vladivostok, with a branch southward to the Liaotung Peninsula. Russia, however, wanted an ice-free port in the Far East, since Vladivostok is frozen half of the year, and in 1898 she secured from China a 25-year lease on the lower end of the Liaotung Peninsula, with its two excellent harbors of Port Arthur and Talien, called by the Russians Dalny and by the Japanese DAIREN. Russia proceeded to heavily fortify Port Arthur, to make it a naval base for her warships in Far Eastern waters, and to develop Dalny as a commercial port.

The rights given with the railway concession to Russia were those to open coal and iron mines in certain of the rich fields near the railway. These mines were included as part of the railway zone. Russia did comparatively little in developing the mineral resources; her interest in Manchuria was political rather than economic. She pushed down into Manchuria as a move in the realization of her century-old dream of establishing a great Far Eastern Empire.

In 1900, using the excuse of the BOXER UPRISING in China, Russian troops occupied virtually the whole of Manchuria. Russian intrigue in Korea also indicated that the Russians hoped to establish control over that country. Japan became alarmed at this potential threat to herself. She also felt a growing need for access to the coal and iron resources of Manchuria. Negotiations between the Japanese and Russians, initiated by the Japanese, in which the Japanese hoped to secure a pledge from Russia to check her expansion into Manchuria and Korea, dragged along for three years without any definite results. Finally, in 1904, Japan declared war on Russia, on the ground that she must protect herself against the threat of Russian expansion.

The war lasted for roughly a year (*See* RUSSO-JAPANESE WAR and PORTSMOUTH, TREATY OF), and Japan won. By the terms of settlement, Japan secured control of that part of the Russian Chinese Eastern Railway which lay in South Manchuria, together with the appertinent mining rights, as well as of the leasehold on the Liaotung Peninsula. China's consent to this transfer of interests was secured by a special treaty signed at the end of 1905.

Japan proceeded at once to develop her interests in Manchuria. The railway was put under the control of the specially-organized SOUTH MANCHURIA RAILWAY COMPANY, and the administration of the Leased Territory was organized along the general lines of a Japanese province. The Japanese government retained half interest in the railway company, and this company became the agency for governmental activity in the economic development of Japanese holdings in South Manchuria. Special attention was given to the development of the coal and iron resources lying in the railway zone; the railway was improved, large sums were spent in developing the harbor at Dairen for commercial purposes, substantial amounts were placed at loans to the Chinese for the construction of railway lines which would be feeders for the South Manchuria Railway though nominally part of the Chinese government railway system, agricultural experiment stations were established; schools were opened and in a wide variety of ways, steps were taken to develop the economic resources and the agriculture of South Manchuria and, particularly, to make this region an important source of raw materials for Japan. According to estimates of the South Manchuria Railway Company, Japanese investments in Manchuria, not including government buildings, at the end of March, 1930, totalled approximately $850,000,000, or roughly two-thirds of all Japan's investments in China.

Japan's interests in Manchuria, particularly her coal and iron holdings have been developed to the point where their loss would very seriously cripple the present and future industrial life of Japan. She increasingly is depending, too, on food supplies secured directly, or indirectly through Chosen, from Manchuria. This growing economic dependence of Japan on Manchuria has made the Japanese peculiarly sensitive to every move which threatened to weaken their hold on their interests in the area.

Partly as a result of these Japanese developmental activities and partly through the settling of Manchuria by immigrants from China, the improvements introduced by the Japanese being in turn part of the cause for the flood of Chinese immigrants, business in Manchuria, particularly in South Manchuria, increased enormously. The total import and export trade in 1908 was approximately $75,000,000. In 1929 it was $566,000,000, an increase of 655%.

The South Manchuria Railway, which, in 1930, owned directly or indirectly about 61% of all the Japanese investments in Manchuria, made large and growing profits year by year, but put substantial parts of these profits back into new developments and into non-profit-making undertakings such as research laboratories, experiment stations, schools, etc.

Meanwhile, Russia had been doing little in the way of new development in North Manchuria, though the increase in Chinese settlers has been marked in this region also. The political disorganization in Russia which followed the Soviet Revolution of 1917, left the status of the Chinese Eastern Railway in doubt for a number of years. The line was under the control of a joint foreign board, headed by an American, during the time of the SIBERIAN EXPEDITION, 1918-1920, and then passed back to joint Sino-Russian control. In 1924 new Sino-Russian agreements were negotiated, revising the original terms of the Chinese Eastern Railway agreements but leaving the control of the line substantially in Russian hands. In 1929 a sudden attempt by the local Chinese military commander of Harbin to oust the Russian railway authorities and take control of the railway, resulted in a temporary threat of war, with some show of force on both sides. The war threat passed; the Russians secured a return to the status before the Chinese move, and negotiations for a re-

adjustment of the control of the line started in Moscow. These still were continuing at the beginning of 1932. Soviet Russia seemed to have abandoned completely the Czarist dream of expansion into Manchuria.

In order to confirm her position in Manchuria, Japan included in the "twenty-one demands" which she presented to China in 1915 provisions extending the lease of the Kwantung Leased Territory to 99 years from the original 25 years, extending to the same period her right to remain in control of that part of the South Manchuria Railway which formerly had been Russian, and of the part of that railway which she had built (Antung to Shenyang), and giving her subjects the right to reside and lease land for commercial and agricultural purposes anywhere in Manchuria, instead of simply in the railway zone and the Leased Territory. The leasehold on the Leased Territory thus would expire in 1997 instead of 1923, the Japanese control of the part of the Chinese Eastern Railway would continue until 2002 instead of coming to an end in 1983 or, if China wished to purchase the line, in 1939, and the hold on the Antung-Shenyang part of the South Manchuria Railway would continue to 2007 instead of ending in 1923 as the original agreement with China provided. The Chinese have contended that these 1915 treaties were invalid, since they were secured under threat of force. The Japanese have insisted on their validity. This disagreement is one of the important causes of the Sino-Japanese friction in Manchuria.

That friction has been growing for years. The Chinese have objected to the development of Japan's interests in Manchuria, partly on the ground that the development involved interference with Chinese sovereignty and deprived China of the control and use of her own natural resources, and partly from jealousy. In the last three years China has put substantial sums of money into building railways which would be directly competitive with the Japanese-owned South Manchuria Railway. She also has pushed the development of the port of Hulutao, to make it a rival of Dairen. The Japanese, particularly the Japanese military, at times have been overbearing in their attitude toward the Chinese. The influx of Chosenese settlers into eastern Manchuria also has created difficulties.

Incidents of various kinds have occurred, in which the blame lay sometimes on one side, sometimes on the other, all of which have added to the tension. Negotiations between the Japanese and Chinese governments for the settlement of these incidents and other questions dragged along, without results satisfactory to the Japanese.

On September 18, 1931, using as an excuse an alleged bombing of the South Manchuria Railway track 5 mi. north of Shenyang (Mukden) by Chinese soldiers, the Japanese troops launched a sudden and far-flung occupation of all the important cities along the railway. The Chinese deliberately made practically no resistance. Claiming that they must push their advance as a means of self-defense, the Japanese troops spread out along the Chinese railway lines, especially those which had been built with loans from Japanese sources, until, within a month, they were in control of an area of over 100,000 sq. mi., which included the three provincial capitals, all of South Manchuria, except the southern bit running down to China Proper, and part of North Manchuria. The Japanese claimed that this move was necessary for the protection of Japanese lives and interests. The Chinese appealed to the League of Nations and to the United States, under the League of Nations Covenant, the Nine Power Treaty of 1922 and the Pact of Paris. The efforts of the League and the United States to check the Japanese military advance, or even to get a Japanese pledge as to a time of withdrawal, were unsuccessful. The Chinese initiated an anti-Japanese boycott which gradually developed in area and intensity and quickly began to have a very serious effect in Japan. The demand that China officially go to war with Japan also grew among the Chinese. At the end of the year, the Japanese troops moved down toward the Great Wall, and brought all of Manchuria under Japanese domination. The Japanese government, however, insisted that Japan had no territorial ambitions in Manchuria.

An "independent" Manchukuo government was set up by the Japanese army in 1932, and HENRY PU YI was installed as ruler. Japan's pledge, given the League of Nations Council in 1931, to withdraw her troops as soon as her nationals were assured protection had not been carried out by July 1932, Japan holding that "changed conditions render it impossible of fulfillment."

The population of Manchuria has increased from around 12,000,000 in 1907 to approximately 30,000,000 in 1931. Of the population 97% are Chinese. The remainder include 220,000 Japanese and something over 550,000 Chosenese. G. C.

MANCHUS, a people of Mongolian stock whose original home was in Manchuria. The Manchu tribes gradually forged to the front in tribal conflicts in the relatively thinly settled Manchurian area, and by the 13th century had established a loose sort of control over about one third of this region. Their power was broken by the Mongol invasions, but under the leadership of Nurhachi (1559-1626) they regained power. In 1643 Nurhachi's grandson established what he called the Ta Ching ("Great Pure") dynasty in Manchuria. Soon afterwards the Chinese emperor in Peking called in the Manchus to assist him against a revolt, but misunderstandings arose and the Manchu commander turned against the Mings and took control of the throne. The Manchu dynasty ruled China from 1644 to 1912, when it gave way to the Republic. After they secured control of China the Manchu people migrated into that country in great numbers, and from the emperor down took on Chinese civilization as rapidly as possible. The old Chinese forms of examination for political office, etc., were maintained, and two of the earlier Manchu emperors, Chien Lung and Kang Hsi, con-

tributed largely to the development of Chinese literature and art. The Manchu people today are comparatively few in numbers in both China and Manchuria, and are rapidly losing their racial entity.

MANDA, a name given to a few scattered fragments of INDO-IRANIAN preserved in CUNEIFORM texts found at Boghaz-köi in Asia Minor, particularly in proper names, the names of four deities, and some numerals. The words date from the middle of the second millennium B.C., are Indian rather than Iranian in type, and possibly imply that a section of those Indo-Iranians who later became Indians had been driven westward by kindred invaders who subsequently became Iranians.

MANDAEAN, a Semitic language of the East ARAMAIC group spoken in lower Mesopotamia and closely related to the language of the Babylonian *Talmud.* Its outstanding characteristics are employment of letters to express vowel-sounds, and complete deterioration of the gutturals. Since Mandaean was spoken by an isolated Gnostic sect, it was not exposed to Hebrew or Greek influence like other Aramaic dialects, so that in grammar, syntax and vocabulary it preserves the purest type of this Semitic group.

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MANDALAY, the principal city of Upper Burma, India, situated on the Irrawaddy, in 21° 59′ N. lat. and 96° 8′ E. long. At one time the capital of Burma, the old city stands encompassed by a moat 225 ft. wide and by battlemented walls 27 ft. high. After the occupation by the British in 1885 the walled city, which contains a palace, became a place of arms and was named Fort Dufferin.

The present town occupies an area of 25 sq. mi. The houses on the river and in the suburbs are of the usual Burmese type: frail structures of bamboo and matting erected on piles sunk in the mud. They are generally small and packed closely together, and their materials are inflammable, consequently serious fires have occurred. The main streets are lined mostly with brick houses, but even here the bricks are merely attached to the wooden framework. Although not a commercial center of importance, all industries characteristic of the country are found in Mandalay. A specially flourishing trade is the manufacture of sacred images in marble and steatite. In the middle of the town is the Zegyo, one of the finest covered bazaars in the East, where silks and jewels and miscellaneous goods are displayed in abundance. The town is studded with pagodas and monasteries, for the most part modern. Pop. 1921, 148,917; 1931, 148,292.

MANDAMUS, a writ issuing from a court of superior jurisdiction directed to a public officer, an inferior tribunal, or a municipal corporation or a private corporation, commanding performance of a public or official duty, such duty being ministerial, that is, one not involving discretion on the part of those who are to perform it. It is brought in the name of the state at the instigation of the person seeking to have the duty enforced.

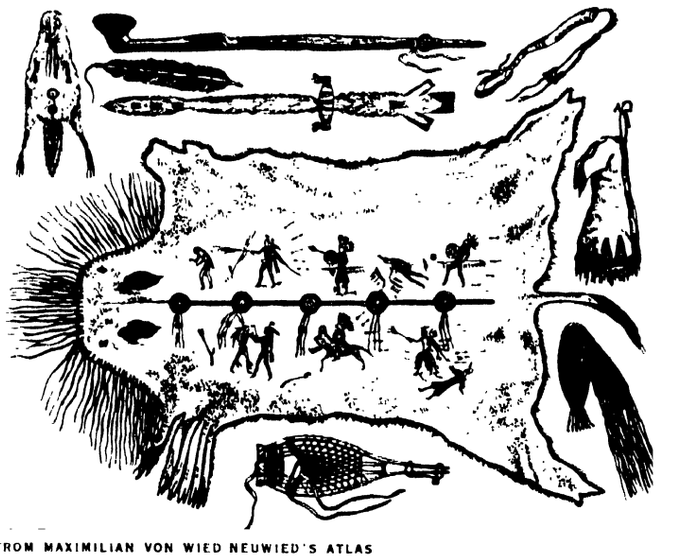
MANDAN, an Indian tribe of the Northern Plains speaking a dialect of the Siouan linguistic stock. Closely allied to the Hidatsa, they lived on the banks of the Upper Missouri in North Dakota, though they have traditions of a more easterly origin. Unlike the typical Plains groups they relied to some extent on agricultural products for their subsistence, living in villages of earth-lodges and using the tipi only as a temporary dwelling. Almost completely annihilated by a smallpox epidemic in 1837, the scant remnants of this once populous group joined the Hidatsa, with whom they have since remained, living on a reservation with them at Ft. Berthold, N.D. Except for their dependence on agriculture, the use of the earth-lodge as a dwelling, and the making of pottery, they were in most other respects typical of Plains Indian culture.



FROM MAXIMILIAN VON WIED-NEUWIED'S TRAVELS

MANDAN INDIAN
From a drawing by Karl Bodmer

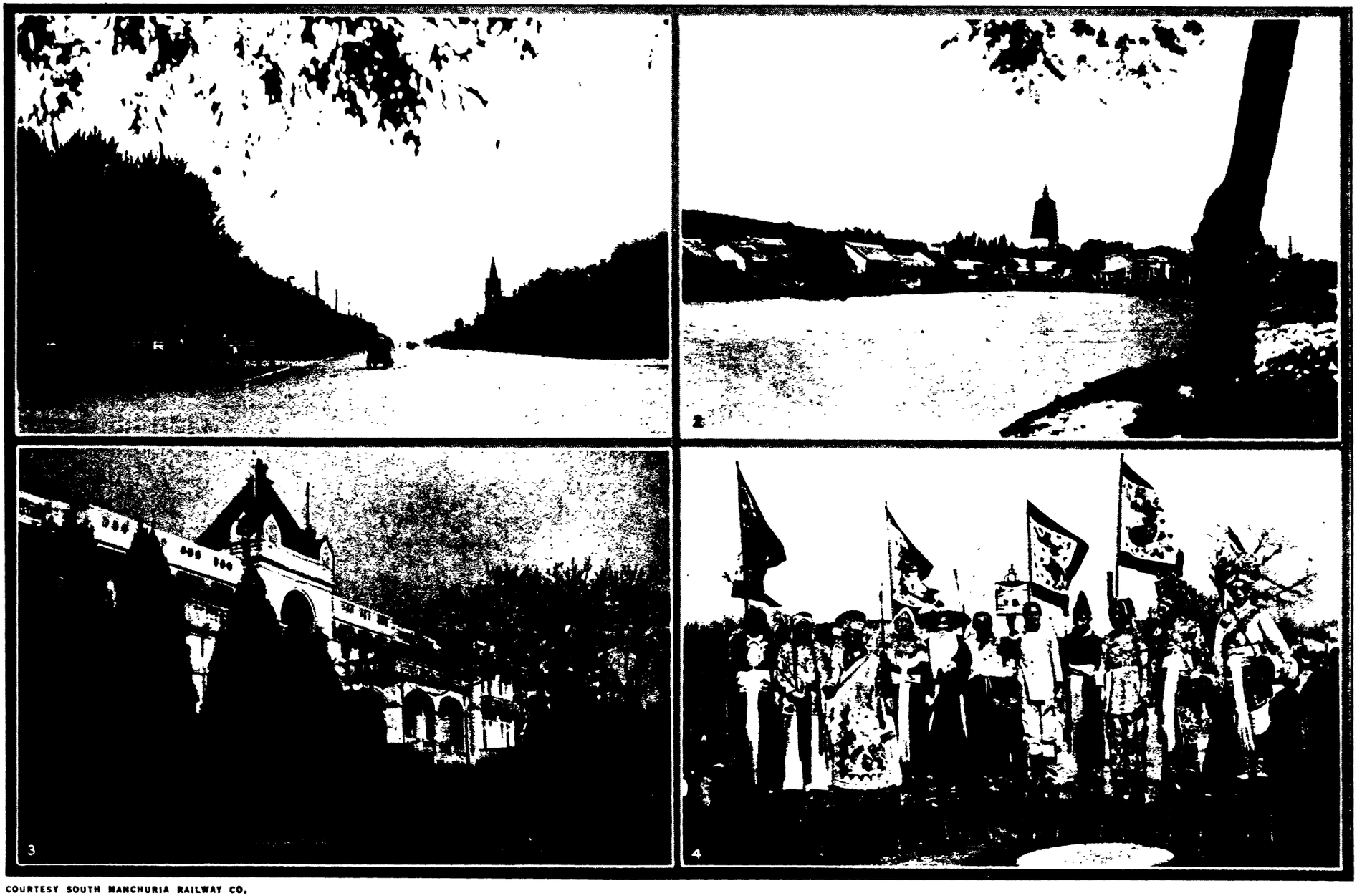
MANDAN, a city in southwestern central North Dakota, the county seat of Morton Co., situated on the Missouri River, just west of Bismarck. It is served by the Northern Pacific Railroad. Mandan is a market for grain, dairy products and live stock, and has two creameries and a beverage factory. Lignite coal is mined near by. The Northern Great Plains Experiment Station is located here. Several Indian reservations are in the vicinity. Mandan, founded in 1872, was incorporated in 1884. Pop. 1920, 4,336; 1930, 5,037.



FROM MAXIMILIAN VON WIED NEUWIED'S ATLAS

BUFFALO ROBE PAINTED WITH WAR SCENES, AND OTHER ARTICLES USED BY THE MANDAN INDIANS
From a drawing by Karl Bodmer

MANDARIN, a name formerly applied in general to any public official of China, either civil or military.



COURTESY SOUTH MANCHURIA RAILWAY CO.

SCENES IN MODERN MANCHURIA

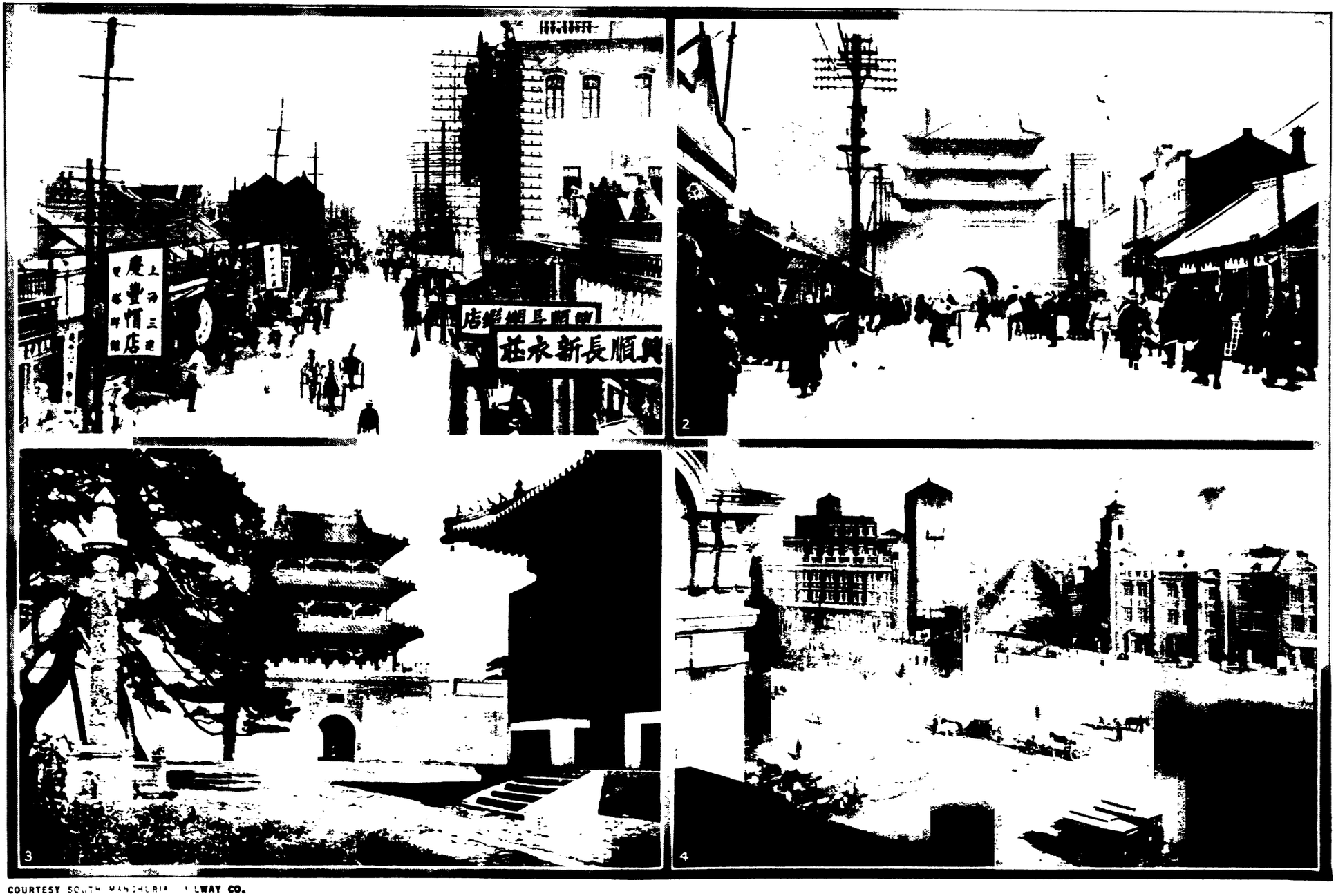
1. Changchun. One of the broad main streets of the new town. **2.** White Lama Pagoda at Liaoyang, the oldest city in Manchuria. **3.** The government offices of Kwantung Province in Port Arthur. **4.** Stilt masquerade, one of the favorite outdoor amusements of China.



COURTESY SOUTH MANCHURIA RAILWAY CO.

THE INDUSTRIAL CITY OF ANSHAN, MANCHURIA

1. View of ironworks for which the town is famous. **2.** Takushan iron-ore mines. **3.** Street in the Chinese section. **4.** Casting pig iron at the Anshan ironworks.



COURTESY SOUTH MANCHURIA RAILWAY CO.

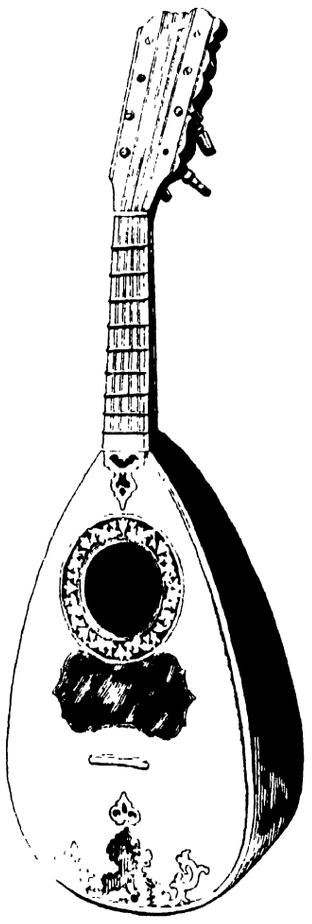
MUKDEN, MANCHU CAPITAL AND MODERN CITY

1. Chinese Town, a section of the city. 2. One of the main streets of the old walled city.
3. Scene in North Mausoleum, containing the tombs of the Manchu emperors who made this ancient city their capital. 4. A street in New Town, the Japanese center.

Strictly speaking, the mandarin comprised the officials entitled to wear a ball or button on their cap or an emblazonment on their breast as insignia of their office. There were nine ranks of such officials each being distinguished by its particular insignia. All officials are now known as *kuan,* a general term for "official."

MANDATES. The mandate system came about by the conditions set up by the covenant of the League of Nations as part of the Treaty of Versailles for the administration of the former overseas possessions of Germany and Turkey. Mandatory powers were selected by the Supreme Council of the Allies to administer the foregoing territories under mandate. By the requirements of the covenant, three classes of mandates were formed owing to varying conditions in each of the mandated territories. Examples of Class A are Palestine, Syria and Iraq; of Class B, Central African colonies; of Class C, certain Pacific Islands and certain territories possessed in southwest Africa.

MANDEANS, an ancient Oriental sect, still existing in lower Mesopotamia. Their beliefs, characterized by a kind of Gnosticism, are a syncretism of Christian, Jewish, Parsi and Pagan elements. Because they attach great importance to the right of baptism, they have also been called Sabians, from Subba, meaning Baptists, and, inappropriately, Christians of St. John the Baptist. They are not a Christian sect; Jesus they regard as an evil spirit. They revere John the Baptist as the only true prophet, rejecting all the other Biblical prophets, including Jesus, as false. Like other Gnostic sects, their cosmological speculations begin with a most abstract idea of divinity, and include notions of an original abyss, primal aeons and a demiurge.



M. M. OF ART

MANDOLIN

Made at Naples about 1770 by Vincentius Vinaccia

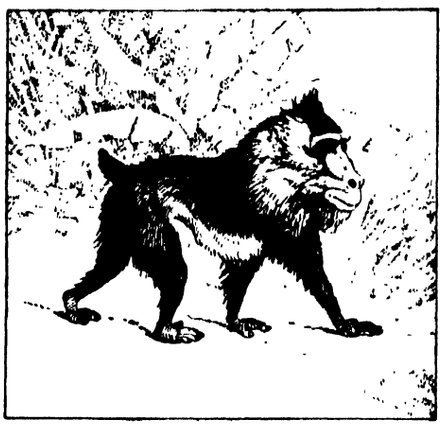
The Mandeans possess a large and important body of literature, including five sacred books, written in a dialect of the Aramaic branch of the Semitic languages. They have three degrees of priesthood, admit women into the clergy, are polygamous, and compel their priests to marry. The sect numbers about 2,000.

MANDEVILLE, SIR JOHN, the alleged writer of a 14th century book of travels. The identity of Jehan de Mandeville or John Maundevylle, knight of St. Albans, has never been determined. His book, which attained great popularity, was intended as a guide for pilgrims to the Holy Land. The first part is based largely on the travels of William Boldensele, 1336, and on the work of Friar Odoric of Pordenone, 1330. The sections dealing with Jerusalem and Egypt may possibly be based on the personal experience of the author. The book was originally written in French and the oldest extant French manuscript is dated 1371. The earliest English manuscript dates from the 15th century.

MANDOLIN, a stringed musical instrument belonging to the lute family. It has an almond-shape body equipped with 4-6 pairs of metal strings vibrated by means of a plectrum, and a fretted neck. The compass is three octaves.

MANDRAKE (*Mandragora officinarum*), a poisonous herb of the nightshade family native to Europe and Asia. It is a stemless perennial with a spindle-shaped, often branching root, oblong basal leaves and greenish-yellow flowers. Because of the occasional resemblance of the root to the lower part of the human figure the plant was long reputed to possess great magical virtues and, when torn from the earth, to shriek with dire consequences to the hearers. The American May apple (*Podophyllum peltatum*) is also called mandrake.

MANDRILL, a large dog-headed baboon (*Papio sphinx*) of west Africa and Arabia. It is black, powerful and ferocious; has a massive head with bulging



MANDRILL

blue cheeks, and its long, ribbed face is striped with bright blue and purple, while most of the ridge of the nose is scarlet and the mouth black; the stern surrounding the stublike tail is naked and purplish. The colors become brilliant under excitement. These hideous and pugnacious animals dwell in rocky retreats, live mainly on fruits and insects, raid the adjacent plantations and terrorize the natives, and themselves fear only the leopard. Living specimens are frequently exhibited in zoological parks. E. I.

MANDURIA, an ancient city of Italy in Lecce in Apulia, located east of Tarentum, the modern Taranto. Rome took Manduria in 209 B.C. In the 10th century the Saracens destroyed Manduria; but the

inhabitants built a new city, known until 1700 as Casalnuovo, nearby.

MANES or **DI MANES,** in Roman mythology, the good gods. At first they were considered deities of the lower world and invoked at funerals, but later were said to be the spirits of the departed. Offerings were made to them of milk, oil, honey, wine and the blood of black victims. The Manes were worshiped at the festivals *Feralia* and *Parentalia.* Each household had its own Manes which were the souls of the dead ancestors.

MANET, EDOUARD (1832-83), French Impressionist painter, was born at Paris, Jan. 23, 1832. He studied the Spanish masters, revolted from the insipid Couture and when his *Olympia* created a scandal at the Salon of 1865 began exhibiting privately and collecting about him the group of painters afterwards known as the Impressionists. (*See also* IMPRESSIONISM.) Manet was the pioneer of modern realism; like most pioneers he was not always successful in his experiments. Although he stated that "light is the principal person in a picture," he seldom succeeded in fixing light in his pictures. He used no subtle gradations but painted in bold patches with flat, broad tones. His cold, biting colors are set against neutral grounds, and since he sacrificed modeling in order to render absolute contrasts of black and white, his works often have a flat, brilliant poster-like effect. Manet's most famous canvases, *Olympia, Picnic on the Grass* and *The Fife Boy,* are in the Louvre, Paris. Among his works at the Metropolitan Museum, New York, are the *Boy with a Sword, The Funeral* and *Woman with a Parrot.* Manet died at Paris, Apr. 20, 1883.

MANEUVER, to move a military force or the movement executed by a military force for the purpose of carrying out a tactical enterprise under actual or assumed combat conditions. In military training a field exercise involving two opposing forces, one of which may be assumed, is called a maneuver. A similar exercise conducted on a map with both forces assumed is called a map maneuver.

MANGABEY (*Cercocebus*), a long-tailed west African monkey closely related to the guenons on the one side and the macaques on the other and characterized chiefly by the bare, almost white upper eyelids. Peculiarities in their teeth as well as the backward growth of the hair on the crown of the head and the prominence of the eyebrows distinguish them from other monkeys. Mangabeys flourish in captivity. The kind most frequently seen in zoological gardens is the sooty mangabey which makes a gentle, amusing pet. It carries its long tail oddly thrown forward over its back.

MANGANESE, a gray metallic element, symbol Mn, atomic weight 54.93; specific gravity 7.42; melting point 1244° C.; occurring chiefly as pyrolusite, MnO_2. The largest deposits are in Russia, India, Brazil and the Gold Coast. The metal is reduced from ore with carbon by smelting in the BLAST FURNACE.

The steel industry uses over 90% of the manganese mined. It serves as a deoxidizer, offsets the harmful effects of sulphur in steel, and increases its strength and toughness. One and one-half per cent manganese steels are used for case hardening. Steels containing 12 to 14% of manganese are extremely hard. Compounds of manganese are used as oxidizers in various chemical processes; in the treatment of glass and pottery for color and in many dyes.

Traces of manganese appear essential in human metabolism, a sufficient amount of which is generally obtained in the use of ordinary foods. Small doses of manganese, like other elements, increase materially the growth of plants. Chronic poisoning results from over-exposure to the dust of any of the compounds of manganese as may occur in industries. C. H. H.

MANGANESE STEEL, steel containing about 12% of manganese. Small quantities render steel brittle, but larger quantities make steel hard and ductile. This steel is generally used in articles such as safes, crushing machinery and tools, which must be extremely hard. The steel is cooled quickly so that its great ductility can be retained. Slow cooling results in a brittle product. In either case this steel does not lose any of its hardness, and that one quality makes it difficult to cut or work into shape. The one particular shortcoming of manganese steel for structural purposes is its low elastic limit.

Manganese tends to lessen the malleability of steel, but when used in steel in limited quantities it reduces the effect of such chemical constituents as sulphur and oxygen. Consequently it has a valuable place in the purification of ordinary steels. The United States produces only a fraction of the manganese consumed in its steel industry. V. G. I.

MANGEL-WURZEL, the name given to coarse varieties of the common BEET (*Beta vulgaris*), extensively grown in temperate regions, especially in Europe, for stock food. The fleshy reddish or yellowish roots, often exceedingly large, vary in shape from narrow-oblong to globular and are sometimes twisted. They are much relished by livestock, especially by pigs, rivaling the SWEDE. The plants are very susceptible to cold, but if the roots are harvested and stored before freezing, they will keep until late spring. *See also* BEET; SWEDE.

MANGO (*Mangifera indica*), a large evergreen tree of the cashew family, cultivated for its edible fruit, an important article of food in the tropics. It is a native of northern India, Burma and Malaya, widely grown in many tropical and subtropical countries and sparingly planted in southern Florida and California. In India, where its cultivation dates to remotely ancient times, more than 150 varieties are grown. The fruit, a large, fleshy, smooth-skinned drupe, resembling the apricot in color and sometimes weighing 4 or 5 pounds, has a spicy aromatic odor and, in the finer qualities, a very delicious flavor. Mangoes are much used for desserts and are often dried or made into pickles, jams and preserves.

MANGOSTEEN (*Garcinia Mangostana*), a small tree of the garcinia family native to the Malayan

region, widely grown in the tropics for its delicious fruit. It is a slow-growing tree, sometimes 30 ft. high, with large, thick, leathery leaves, fleshy pink flowers and reddish purple fruit, somewhat resembling an orange in size and structure. The flavor of its white, juicy, refreshing pulp is described as a compound of that of the peach and the pineapple.

MANGROVE, a genus (*Rhizophora*) of small evergreen trees of the mangrove family. There are three species found widely on the shores of tidal marshes throughout the tropical regions, one of which, the common mangrove (*R. Mangle*), extends northward to the coasts of southern Florida and Lower California. The common mangrove grows usually 15 to 20 ft. high, with spreading bushy branches and numerous aerial roots, forming almost impenetrable thickets. It bears reddish-brown astringent bark, oblong glossy leaves, pale yellow flowers blossoming throughout the year, conical berry-like fruits and seeds that germinate in the air.

By reason of their peculiar modes of growth and germination, mangroves are enabled not only to protect low shores but also to reclaim each year fresh portions of land from shallow borders of the ocean. This reclamation is effected partly by the progressive advance of the aerial, banyan-like prop roots, which curving outward and downward from the trunk, establish themselves in the muddy bottom and give rise to new trees. Land recovery is further aided by the aerial germination of the seeds, which develop into miniature trees with long heavy radicles ready to put forth roots and leaves when they fall erect into the water from the overhanging limbs of the parent plant.

MANHATTAN, a city in northeastern Kansas, the county seat of Riley Co., situated on the Kansas River at the mouth of the Big Blue River, 60 mi. northwest of Topeka. Two railroads and bus lines serve the city. Grain is the chief crop of the vicinity. The city has flour mills and an iron foundry. The retail trade reached a tota. of $7,616,187. Manhattan is the seat of Kansas State Agricultural College, established in 1863. The city was founded in 1857 by New England settlers and was incorporated in 1880. Pop. 1920, 7,989; 1930, 10,136.

MANHATTAN COLLEGE, a Catholic institution for men established in New York City, 1853. It is an outgrowth of the Academy of the Holy Name for boys opened in 1849 by the Brothers of the Christian Schools, and is still conducted by that institute. The college departments comprise arts and sciences, civil and industrial engineering, and commerce; there are also extension and summer school courses and a preparatory school. In 1930 the faculty numbered 40 under the presidency of Brother Cornelius, and the students 850.

MANHATTAN ISLAND, an island, comprising the borough of Manhattan in NEW YORK CITY, situated on New York Bay. The island is approximately 13 mi. long and 2 to 2¼ mi. wide. The Harlem River and the Harlem River Ship Canal or Spuyten Duyvil Creek on the north and northeast, the East River, and the Hudson River on the west form the boundaries.

MANICHAEISM, an eclectic religion based on Zoroastrian dualism combined with Christian, Buddhistic and other elements, which was founded by Mani, a Persian born at Mardinu in Babylonia about 215-216. Mani first proclaimed his new system in Persia about the middle of the 3rd century, in the reign of Shapur I. He later spent many years traveling in many lands, returned to Persia, and was crucified at Gundeshapur, in 276-277, by the Zoroastrian Magians. Largely owing to its comprehensive eclectism, Manichaeism spread rapidly East and West, and during the 4th and 5th centuries was embraced by a large number of Christians, especially those of the cultured classes, who were attracted to it by the philosophical appeal. Augustine was one of its enthusiastic devotees for nine years.

Manichaeism held to two principles of creation, both principles eternal and equally independent. The good comes from God, who presides over the kingdom of light. From Satan, king of darkness, and his bad angels, springs evil. Between these two antagonistic forces, a constant struggle is going on. Man's spirit emanates from light, and is good; his body comes from darkness, and is evil. The Manichaeans, who practiced a rigid asceticism, distinguished among themselves two classes, the Perfect, or initiated, and the Hearers, or novices. A number of medieval sects were influenced by Manichaeism.

MANICURE PREPARATIONS, chiefly nail polishes to give a high luster to the nails and preparations for the care of the cuticle. It is estimated that nails require a manicure about once a week to be considered well groomed. The manicure consists of filing nails the desired length and shape; keeping the cuticle even and smooth by using a liquid cuticle remover or by softening it and pushing it away from the nails with oils and creams. Cuticle removers are usually a very weak solution of potassium hydroxide, to remove the dead skin around the nails. Nail polish, powder (or in powder blocks), is usually of tin oxide in about twice its weight in chalk; paste polish in cake or paste form made of waxes and colored with a red dye. Liquid polish is a thin lacquer or varnish, tinted usually in various shades of rose, subject to the prevailing vogue in cosmetics, and applied with camel's-hair brush. *See also* HAND PREPARATIONS; NAIL POLISHES. G. R. F.

MANIÈRE CRIBLÉE, an early and short-lived method of engraving, producing prints in which the design is developed in white dots and lines on a black ground. These much discussed "dotted prints," called in Germany *Schrotblätter,* in France *gravure en manière criblée* (meaning "sieve-fashion"), are extremely rare. Because of their rude character some authorities consider them the earliest examples of engraving. They were probably executed with graver, or punch, on metal plates. Koehler, who ascribes them to the late 15th or early 16th century, calls them

"premature precursors of modern white-line engravings."

MANIFEST, a shipping document giving a list of a ship's cargo. The list states the contents of packages and cases, marks on them, name of shipper and consignee, and must be presented at the Custom House before the vessel sails.

MANIFOLDING MACHINES, machines which make several copies of written or printed material in the same "set up." There are several types, including those which employ stencils, type, plates, ink impressions on gelatine and carbon paper in making duplications. Among these are the TYPEWRITER, ADDRESSING and autographing machines, HECTOGRAPHS, and special patented machines.

MANILA, capital, chief port and leading commercial and industrial city of the PHILIPPINE ISLANDS, situated on the southwestern coast of the Island of Luzon and at the eastern extremity of Manila Bay, in 14° 35′ 41″ N. lat. and 120° 58′ 33″ E. long. The city, covering a land and water area of 14 sq. mi., is built on both banks of the Pasig River, and is the terminus of the Philippine Railroad Co. The city is the headquarters of the governor general and the Philippine Senate and House of Representatives. Manila owes much of its maritime importance in transpacific shipping to Manila Bay, which forms a landlocked harbor 120 mi. in circumference, upon which the city has a frontage of 4 mi. The harbor development, including docking facilities for the largest vessels, cost $4,000,000. The port district is on the southern side of the Pasig. The government piers, constructed chiefly on reclaimed land, are protected by a long breakwater. With the peso at $.50 United States currency, in 1930 exports at Manila totalled a value of 130,251,462 pesos and imports 214,910,278 pesos.

Although the character of Manila has been modernized since the American occupation in 1898, parts of the city retain both Spanish and native Malay characteristics. The old city, Intramuros, is south of the river and is circumscribed by a thick stone wall. The principal square is named Plaza McKinley, flanked by the cathedral and the government building. The foreign residential district is mainly south of the Pasig, along Gen. Solano Drive and on streets leading from Dewey Boulevard and Taft Avenue. North of the river is the Binondo district, given over to retail and banking establishments located on the Escolta and the Calle Rosario. Further north is Tondo, the native quarter of nipa and bamboo huts. In Manila is the oldest university to fly the American flag, the University of Santo Tomas, founded in 1611. The University of the Philippines, a state institution, is located here. *See* PHILIPPINES, UNIVERSITY OF THE.

The city was founded by Miguel Lopez de Legaspi in 1571, and in 1762 it was held 15 months by the British. Here, on May 1, 1898, in the Spanish-American War, an American naval squadron under Com. George Dewey destroyed a Spanish fleet. *See* MANILA BAY, BATTLE OF. The Spanish governor surrendered to the United States on Aug. 13, 1898. Pop. 1918, 285,306; est. pop. 1930, 300,000. In 1918 Filipinos in Manila numbered 259,437, Chinese 17,760, Japanese 1,612, Americans 2,916, Spaniards 2,050; the remainder were English, Germans, French and Swiss.

MANILA BAY, BATTLE OF, May 1, 1898, a battle in the SPANISH-AMERICAN WAR in which the spectacular victory of the Asiatic Squadron of the United States navy brought national distinction to Commodore GEORGE DEWEY. Receiving orders at Hong-Kong, on Apr. 24, to commence operations against the Spanish fleet of 10 vessels, under Admiral Montojo, in the Philippines, Dewey with nine vessels and 1,678 men proceeded to Luzon. During the night of Apr. 30-May 1 he slipped past the batteries commanding the entrance to Manila Bay, taking a position just off Manila. At dawn the shore batteries and the Spanish fleet opened fire, beginning a severe naval battle which lasted until noon. The Spanish fleet was totally destroyed and the shore batteries disabled. Dewey's loss was seven wounded, none killed, no vessel disabled; the Spanish casualties included 381 mortalities and numbers wounded.

The capture of Manila, Aug. 13, 1898, was the final engagement of the SPANISH-AMERICAN WAR. Gen. Merritt, embarking from San Francisco June 29 with an American army of about 20,000 men, arrived in Manila Bay on July 25. Attacking by land, with the cooperation of a native insurgent army under Aguinaldo and the American fleet under Dewey, the American army captured all of Manila except the walled city; a signal of surrender was then displayed from the walls. With the capitulation of the city 13,000 Spaniards were taken prisoners. The American loss was only 17 men.

MANILA HEMP, a name given to ABACÁ, a valuable textile fiber produced in large quantities in the Philippine Islands from a species of banana.

MANIOC, called also CASSAVA, a somewhat shrubby herb of the spurge family native to Brazil and widely cultivated in the tropics. It bears starchy tuberous roots from which tapioca and other food products are made.

MANIPLE, in ecclesiastical usage, originally a linen cloth used by the celebrant of the Mass as a handkerchief, but since the 12th century a broad band attached to the left forearm corresponding in color to the CHASUBLE. It is said to represent the manacles with which Christ was bound.



COURTESY M. M. OF ART

MANIPLE OF EMBROIDERED SATIN
French, 16th century

MANISA (ancient *Magnesia ad Sipylum*), a city of Asiatic Turkey, principal city of the Sarukhan vilayet, located near Mt. Sipylus and 40 mi. by rail from Smyrna. It also has rail connection with Afyon-Kara-Hissar. The city contains many interesting buildings dating from Seljuk and early Osmanli sultans and including many synagogues, mosques, Armenian and Greek churches. Captured by John Ducas, it became the Byzantine capital when he became emperor, but in 1398 it was occupied by the Osmanli sultan, Bayezid I. The palace of the Kara Osman Oglu family, into whose hands Manisa fell in the 17th century, is still the most notable building. Manisa is an important commercial center, manufacturing cotton goods and pack saddles. Pop. 1927, 92,761.

MANISTEE, a port city in western Michigan, county seat of Manistee Co., situated on Lake Michigan, which is connected with Lake Manistee, the inner harbor of Manistee River. The city is a summer resort and shipping point, served by lake steamers, buses, trucks and two railroads. The chief manufactures are salt, paper, chemicals, iron, boats and canned goods. Orchard Beach State Park is 2½ mi. north. Manistee was founded in 1849 and chartered as a city in 1869. Pop. 1920, 9,694; 1930, 8,078.

MANISTIQUE, a port city in northern Michigan, county seat of Schoolcraft Co., situated on the northern shore of Lake Michigan, 55 mi. northeast of Escanaba. Lake steamers, car-ferries and two railroads afford transportation. The industries include fishing and the manufacture of lime, paper, pulp, crushed stone, lumber and wood products. Many cattle and sheep are raised in the district. The many lakes and beautiful surroundings have made the region a popular vacationing section, with many resorts, hotels and camps. Near by is a large spring, the Great Boiling Cauldron, called Kitchitikipi, sacred to the Chippewa Indians. The bowl is 400 ft. across and 50 ft. deep. Manistique was chartered in 1901. Pop. 1920, 6,380; 1930, 5,198.

MANITOBA, a province of Canada, the most easterly of the three Prairie Provinces, bounded on the west by Saskatchewan, south by the United States, north and northeast by the Northwest Territories and Hudson Bay and east by Ontario.

The province has two steppes, one generally flat and the other rolling. About half the area of the province is covered by the flat prairie steppe which is distinguished from the other by the Pembina, Riding and Duck mountains in Manitoba and the Porcupine Range on the western boundary. The Turtle Mountains are in the southwest portion of the province. The northeastern districts have large areas of marshland.

Area. The original area of the province was 13,000 sq. mi., but now is 251,832 sq. mi. There have been two extensions: the first in 1881 when the western boundary was carried from 90° W. long. to its present position at approximately 102° W. The second extension was made in 1912 when the province acquired a large part of the territory of Keewatin, an area of about 178,000 sq. mi. to carry the boundaries north to the 60th parallel and northeast to the southern coastline of Hudson Bay.

Inhabitants. The population in 1901 was 255,211; in 1911, 455,614; in 1921, 610,118; and in 1931, 700,139. The Anglo-Saxon proportion of the inhabitants is about 58%, and although some one race is predominant in every district, a racial map would show the balance to be made up mainly of Ukrainians, French, Germans, Scandinavians, Galicians, Dutch and Icelanders.

Lakes and Rivers. The largest lakes, Winnipeg, Winnipegosis, Manitoba and Dauphin, are drained by the Nelson River into Hudson Bay. Lake Winnipeg is 260 mi. long with an average width of 30 mi. The Nelson is now the most important river in the province. Although only 250 mi. in length it has great power potentialities as it carries the waters of the Red, Assiniboine and Winnipeg rivers and their drainage basins. The Red River, 700 mi. in length, has the greater part of its course in the United States, and before it empties itself into Lake Winnipeg it is joined by the Assiniboine. Winnipeg, the capital of the province, is situated at the junction of these two rivers.

Climate. Summers are bright and warm, and winters very cold, clear and dry. The summer mean temperature is about 66°; in winter the thermometer sinks to 30°, 40° and occasionally 50° below zero. The annual precipitation is about 20 in.

Agriculture. The soil is a rich black mold resting on a limestone formation or thick, hard clay. Wheat, oats, barley, rye, flax, peas and potatoes are cultivated extensively. The prairie grasses furnish good hay for livestock raising. Dairy farming is slowly increasing north and east of the Winnipeg district. Fruit growing is carried on in the valley of the Red River and at the foot of the Pembina Mountains.

PRINCIPAL FIELD CROPS, MANITOBA

1930 and Five-Year Average 1925-1929

Crop		*Area*	*Yield Per Acre*	*Total Yield*	*Total Value*
		acres	bu.	bu.	$
Wheat	1930	2,470,000	18.3	45,278,000	23,092,000
Av.	1925-29	2,228,876	17.3	38,495,600	40,681,000
Oats	1930	1,590,000	31.8	50,562,000	10,618,000
Av.	1925-29	1,567,806	27.1	42,553,600	18,503,200
Barley	1930	1,991,000	25.1	49,974,000	8,496,000
Av.	1925-29	1,807,475	23.9	43,179,400	23,120,000
Rye	1930	113,000	18.2	2,052,000	472,000
Av.	1925-29	164,121	15.2	2,488,200	1,957,000
Flaxseed	1930	112,000	9.7	1,086,000	1,140,000
Av.	1925-29	116,149	9.7	1,124,680	1,947,600
			cwt.	cwt.	
Potatoes	1930	31,700	83.8	2,657,000	1,727,000
Av.	1925-29	29,111	74.2	2,161,400	2,401,000
			tons	tons	
Hay and clover	1930	437,300	1.80	787,000	5,706,000
Av.	1925-29	314,315	1.76	554,200	4,988,800

Forest Products. The forest area, though very large, does not represent a high average of value.

The trees, spruce, poplar and jack pine are of retarded growth, and valuable hardwoods are missing. The paper industry has established pulping mills in the province. Great areas of timber of merchantable size have been destroyed by fire.

Mining. The earliest mineral industry in the province was the extraction of salt on the west side of Lake Manitoba. Gypsum deposits which were opened up in the late 1890's, near St. Martin Lake, have been in continuous operation since then. New railroad facilities have made possible the handling of large deposits of copper in the Athapapuskow Lake area. Nickel occurs in the southeastern part of the province. Several new properties have been opened up in the northwest section of the province. More than three-fifths of this section is underlain by pre-Cambrian formations similar to those found so richly mineralized in Ontario.

MINERAL PRODUCTION, MANITOBA, 1929

Item		Production	Value $	Rank Among
Gold	oz.	22,455	464,186	
Gypsum	tons	67,269	631,051	
Clay products			362,240	
Cement	bbl.	1,000,258	2,350,606	
Lime	tons	32,246	361,104	
Sand and gravel	"	1,782,085	322,430	
Stone	"	192,109	895,017	
Other products			37,191	
Total all products			5,423,825	

Fisheries. The lakes are well-stocked with whitefish of a high quality, jackfish, trout and pickerel. Icelanders operate on Lake Winnipeg with large fleets. Pike, pickerel, sturgeon and trout are caught in the rivers and streams.

Transportation. In 1929 the railway was completed from The Pas, where it connects with the main line of the Canadian National Railways, to Fort Churchill on the shore of Hudson Bay, a distance of 510 mi. Elevators and port facilities have been constructed at the northern terminus to load transatlantic steamships. The route makes possible a reduction of several hundred miles between Britain and the western provinces of Canada. Navigation is possible on Hudson Bay usually between July and November.

Chief Cities and Towns are Winnipeg, the capital of the province; Brandon, the second city in importance; Portage la Prairie, a wheat center; Churchill, on a natural harbor, becoming financially important; The Pas, an aviation center; and Selkirk, with chemical plants.

History. Manitoba was partly explored early in the 17th century by Henry Hudson. The harbor and river of Churchill were discovered in 1619 by the Danish explorer, Jans Munck. The entire territory of the present Manitoba was included in the grant made by Charles II to the Hudson's Bay Company in 1670. The first agricultural settlement was formed in 1812 under the auspices of Thomas Douglas, Earl of Selkirk, who brought a party of farmers from the highlands of Scotland. They were located on the banks of the Red River, just north of the site of the present city of Winnipeg. In 1868 the Hudson's Bay Company surrendered to the government their exclusive rights to the territory upon payment of about $1,500,000 and a grant of a considerable quantity of land. The matter of transfer was not appreciated by a large part of the population living in the Red River valley, and a rebellion arose in 1869 under the leadership of Louis Riel. The rising was speedily subdued by military forces sent from the east to Fort Garry, the present city of Winnipeg. In 1870 the province was created to include the Red River settlement and a governor was appointed to establish a system of provincial government. The progress of Manitoba has increased since 1878, when Winnipeg was connected with the railroad system of the United States. In 1930 the Canadian government and the provincial administration of Manitoba arrived at a satisfactory agreement for the transfer of the natural resources of the province from the federal authority.

MANITOBA, LAKE, a shallow lake in the province of Manitoba, Canada, situated immediately west of Lake Winnipeg. Its length is 120 mi., its width 5 to 24 mi., its area, 1,711 sq. mi., and its elevation 810 ft. It gathers the waters of Lake Winnipegosis from the north and drains into Lake Winnipeg through the Dauphin River. The shores are low, particularly at the south where the lake graduates into reed-grown swamps.

MANITOBA, UNIVERSITY OF, at Winnipeg, Man., Canada, a coeducational institution established as a provisional university in 1877 and reconstituted in 1900 and again in 1917. It received a land grant of 150,000 acres from the Dominion Government in 1898. Most of the university buildings occupy a site in the heart of the city of Winnipeg. Manitoba had productive funds in 1931 totaling $1,670,000. The library contained 67,460 volumes. In 1930-31 there was a student enrollment of 3,828, and a faculty of 295 headed by Pres. James A. MacLean.

MANITOBA SCHOOLS QUESTION, in Canadian political history, the bitterly contested issue which in 1896 caused the downfall of the Conservative Government. The school funds of Manitoba were divided between two types of schools, Catholic and Protestant (equally, 1870-75; pro-rated, 1875 ff.). In 1890, as a result of a Protestant agitation in which the Protestant Protective Association was prominent, a single public school system was established. An hour's non-denominational religious instruction might be added to the curriculum at the option of the local school board. The Catholic population protested that the new arrangement was in violation of the Manitoba Act of 1870 and of the British North America Act; but the Dominion Government refused disallowance. As the issue spread from provincial to Dominion politics, intensifying religious and racial prejudices, the Liberals made political capital of the question and opposed Conservative attempts at reme-



COURTESY CANADIAN NATIONAL RAILWAYS

FAR-FLUNG SCENES IN THE PROVINCE OF MANITOBA

1. Cranberry Portage, in a mining area in the northern part of the province. **2.** Lower side of the St. Andrews Locks just above the rapids in the Red River near Winnipeg. **3.** Mission at Isle la Crosse, a northern outpost. **4.** The Pas, southern terminus of the Hudson Bay Railway, on the Saskatchewan River.

dial legislation. With Laurier in power, a settlement was effected whereby with the consent of the school trustees and upon request of parents a half-hour's religious instruction should be offered. Roman Catholic and Protestant teachers were to be employed wherever attendance upon religious teaching reached a specified number. Where 10 pupils in a school spoke some language other than English they were to be taught by the bilingual system. The bishops of Quebec continued their opposition to the settlement until quieted by the visit of a papal nuncio.

MANITOU, a town in El Paso Co. in east central Colorado, situated 6 mi. west of Colorado Springs. It is served by the Denver and Rio Grande Railroad and street cars from Colorado Springs. The town lies near Pike's Peak. Manitou is a fashionable health resort. Interesting features, in or near Manitou, are the radioactive mineral springs, the Pike's Peak cog railroad, the Cave of the Winds and the GARDEN OF THE GODS. Pop. 1920, 1,129; 1930, 1,205.

MANITOULIN ISLANDS, a cluster of pine-covered islands in the northern part of Lake Huron, separated from Ontario by North Channel. They consist of Drummond Island, belonging to Michigan, and Grand Manitoulin or Sacred Isle, Little Manitoulin or Cockburn Isle, both of which belong to Canada. There is but a small resident population, the islands being chiefly used as a summer resort.

MANITOWOC, a lake port city in eastern Wisconsin, the county seat of Manitowoc Co., situated on Lake Michigan, 86 mi. north of Milwaukee. Two railroads, lake steamers, ferries, bus lines and airplanes afford transportation. Timber and farm crops are produced in this region. Shipbuilding is the pioneer industry of Manitowoc, which also manufactures aluminum ware, Portland cement, canned goods, furniture and malt products. In 1929 the industrial output was approximately $29,000,000; the retail trade amounted to $13,044,935. The name *Manitowoc* means Spirit Land. A fur-trading post was established here in 1795 by the North-West Co.; permanent settlers came about 1836. Manitowoc became the county seat in 1853, and was chartered as a city in 1870. Pop. 1920, 17,563; 1930, 22,963.

MANIU, JULIU (1873-), a Transylvanian Ruman, active first in Hungarian and then in Rumanian politics, was born at Szilágysomlyo (now Simlaul Sylvanie), attended the universities at Cluj, Vienna, and Budapest, and became professor of law at Blaj. As a prominent member of the National Rumanian Party in Transylvania he was elected a deputy to the parliament at Budapest (1906-10) despite the bitter opposition of the patriotic Magyar Count István Tisza. Sent to the front upon the outbreak of the World War, Maniu returned to Budapest from Italy in the fall of 1918 and helped organize the National Rumanian Council. He then proceeded to Vienna and Prague to foment revolts among the Ruman regiments stationed there under the Hungarian flag. On Dec. 1, he was elected president of the local government which controlled Transylvania and which had voted for union with the kingdom of Rumania.

In 1919 Maniu became president of the National Rumanian Party of Transylvania and for the next few years labored to bring about a coalition between this group and the Nationalist-Democratic and Peasant Parties. His efforts were successful and in 1925 he became president of a new and powerful National Peasant Party. Under Dr. Maniu's leadership the peasants now staged a number of spectacular demonstrations and mass gatherings in protest against the bourgeois dictatorship of the Bratianu brothers, Jon and Vintila. By a "bloodless revolution" on Nov. 9, 1928 Maniu overthrew Vintila Bratianu and two days later formed a National Peasant government. In the elections which followed his party captured over 350 of the available 376 seats in the lower house.

During the ensuing two years Maniu reformed the administration in the direction of decentralization and democratization, reorganized the police and gendarmerie, granted liberal oil concessions to foreign investors, increased the power of the local governments, improved the diplomatic relations with Russia and Jugoslavia (though not with Hungary or Bulgaria), opposed the appointment of the Dowager Queen Marie to a vacancy in the Regency Council for King Michael, and favored the return of Prince Carol. He found it necessary to put down a military conspiracy in July, 1929, and he was violently opposed by Vintila Bratianu who accused him of selling out Rumania's oil reserves to foreigners.

The day after Carol returned to Rumania the Maniu cabinet resigned (June 7, 1930), only to resume office on June 13. But on Oct. 6, Maniu resigned again, ostensibly because of ill health, actually because of dissension within the party ranks and disagreement with Carol in the matter of reconciliation between the latter and Queen Helen. Maniu now went on a voluntary exile to Paris but came back in April, 1931 to aid his party in a struggle for constitutional rights against the king. Defeat in the elections which followed led him to seek retirement on his estates in Transylvania. The National Peasant Party, however, refused to accept his resignation as its president.

MANIZALES, a city of Colombia and capital of the state of Caldes, situated at an elevation of 6,988 ft. 100 mi. northwest of Bogotá. It is an important commercial center of Colombia, being so situated that commerce between Honda and the Cauca valley pass through it. It is also the center of a mining district and is in one of the richest coffee producing regions of the country. Manizales is the newest large city in Colombia, being rebuilt since a devastating fire in 1925. Pop. 1928, 81,091.

MANKATO, a city in southern Minnesota situated on the Minnesota River, 84 mi. southwest of St. Paul. It is the county seat of Blue Earth Co., and a railroad center served by four roads and also bus and truck lines. There is an airport here. Mankato is a hog market center and has various manufactures, including flour, animal food and cement. In 1929 the

factory output reached approximately $9,000,000; the retail trade amounted to $13,499,317. Farming and livestock raising are carried on in the vicinity. The city is the seat of a state teachers' college, a Catholic academy and a Lutheran college. Mankato was founded in 1853 and incorporated in 1868. Pop. 1920, 12,469; 1930, 14,038.

MANKIND, RACES OF. *See* RACES OF MANKIND.

MANN, CHARLES RIBORG (1869-), American physicist, was born in Orange, N.J., July 12, 1869. He graduated from Columbia in 1890, and took his Ph.D. at the University of Berlin in 1895. After 18 years on the physics faculty of the University of Chicago, he spent four years investigating engineering education for national engineering societies and the Carnegie Foundation. He was with the War Department in an advisory capacity from 1918-25, and in 1922 became director of the American Council on Education. His publications include *Manual of Advanced Optics,* 1902, and *A Study of Engineering Education,* 1918.

MANN, HORACE (1796-1859), American educator and statesman, was born at Franklin, Mass., May 4, 1796. On graduating from Brown University in 1819, he tutored there for two years and then studied law. He was admitted to the bar in 1823 and opened an office in Dedham. From 1827-37 he was a member of the Massachusetts legislature and was well started on a brilliant political career when he accepted the secretaryship of the Massachusetts Board of Education he had been largely instrumental in creating. He served in this office until 1848, and remodeled the system of common school instruction in Massachusetts, bringing about a central supervision of the local district schools, severing in large measure the religious domination over the schools, and introducing educational methods observed in a tour of Europe in 1843. Public schools throughout the country adopted similar changes. In 1839 Mann established the first public normal school in the United States in Lexington, Mass. He founded and edited the *Common School Journal,* using this to spread his ideas for educational reform. His annual reports as secretary, in which he advocated radical changes in the school system, raised a storm of criticism; but most of his reform measures were ultimately adopted. From 1848-53 he was a member of Congress, throwing his energies into the fight against slavery. In 1853 he became the first president of Antioch College. He died at Yellow Springs, O., Aug. 2, 1859. In 1900 he was elected to the Hall of Fame. M. R.

See A. E. Winship, *Horace Mann, Educator,* 1896; G. A. Hubbell, *Horace Mann, Educator, Patriot and Reformer,* 1910.

MANN, JAMES ROBERT (1856-1922), American legislator, was born near Bloomington, Ill., Oct. 20, 1856. He attended the public schools and was graduated from the University of Illinois, 1876, and from the Union College of Law in Chicago, 1881. The same year he was admitted to the bar and began practice in Chicago. Continuing his legal activities with an interest in civic welfare, he was a member of the Oakland board of education in Chicago in 1887, and was secretary of the citizens' association which obtained the adoption of Jackson Park as the site for the World Fair. Mann was a member of the city council of Chicago, 1892-96. As a Republican, he was elected in 1896 to the national House of Representatives, where he served for 14 successive terms from Mar. 4, 1897 until his death. He was Republican minority floor leader from 1911-17. In Congress he consistently urged legislation which would reform evil social and economic conditions by governmental regulation. He led the fight in the House for the Pure Food and Drugs Act of 1906, was the author of the so-called Mann-Elkins Act, 1910, whereby the Interstate Commerce Commission was strengthened in its powers. He died in Washington, Nov. 30, 1922.

MANN, THOMAS (1875-), German novelist, was born at Lübeck, June 6, 1875. He was educated at the University of Munich, and settled in Munich in 1894. His first novel, *Little Herr Friedmann,* was published in 1898. His later novels contain considerable autobiographical material and uniformly exhibit powers of keen and delicate psychological observation. Among these are *Buddenbrooks,* 1901, *Tonio Kruger,* 1903, *Royal Highness,* 1909, and *Death in Venice,* 1913. *The Magic Mountain,* 1925, a novel that influenced the award of the Nobel Prize for Literature to Mann in 1929, is a monumental study of decadence in contemporary civilization.

MANNA is an exudation on the trunk of the manna ash tree (*Fraxinus Ornus*), which grows in southern Europe and Asia Minor. This honey-colored exudation contains 70 to 80% of mannite or manna sugar, not present in other tree secretions also called manna. Best known of these is tamarisk manna, found on the branches of *Tamarix gallica,* a tree native to the peninsula of Sinai and Persia. This is thought to be the manna of the Bible. True manna is mildly laxative and was once a popular remedy for children. It is still listed in most materia medicas, but little used. Other mannas, non-laxative and used for food, include oak manna of southwestern Asia, eucalyptus of Australia, European larch manna (*larix decidua*) and American manna from sugar pine (*pinus lambertiana*).

MANN-ELKINS ACT, a statute approved June 18, 1910, drastically amending the INTERSTATE COMMERCE ACT of 1887. Based upon a draft prepared by Attorney-General Wickersham, which was greatly modified in the House and Senate, the act reorganized the administrative structure described under the title, INTERSTATE COMMERCE COMMISSION. Its most notable advance toward national control of the railways was the provision that empowered the commission to suspend advances in rates until investigations could be made, and placed the railways with the burden of proving the reasonableness of the advances. In order to expedite the decision of appeals from rulings of the commission a Commerce Court was established, but ceased to function in 1913.

MANITOBA

Area 251,832 sq.m.
Pop.....700,139

PRINCIPAL CITIES

(Including Figures from Latest Population Estimates)

Pop.—Thousands

1 Beausejour Q 17
17 Brandon...Q 13
1 Carman...R 15
4 Dauphin...O 13
1 Emerson...R 16
2 Minnedosa Q 13
2 Neepawa...P 14
7 Portage la Prairie...Q 15
4 Selkirk...Q 16
2 Souris...Q 13
1 Stonewall..Q 16
1 Swan River N 12
4 The Pas...K 12
6 Transcona..Q 16
2 Virden...O 12
218 Winnipeg.Q 16
1 Winnipegosis N 13

Pop.—Hundreds

9 Bolssevain R 13
8 Carberry...Q 14
8 Deloraine...R 13
7 Gilbert Plains O 13
7 Gimli.....P 16
7 Gladstone..Q 14
7 Glenboro..Q 14
5 Lyleton...R 12
6 MacGregor.Q 14
8 Morris...R 16
5 Oak Lake..Q 12
7 Rivers...O 13
7 Roblin...O 12
6 Roland...R 15
8 Russell...P 12
6 St. Laurent P 16

SASKATCHEWAN

Ar..251,700 sq. m.
Pop.....921,785

PRINCIPAL CITIES

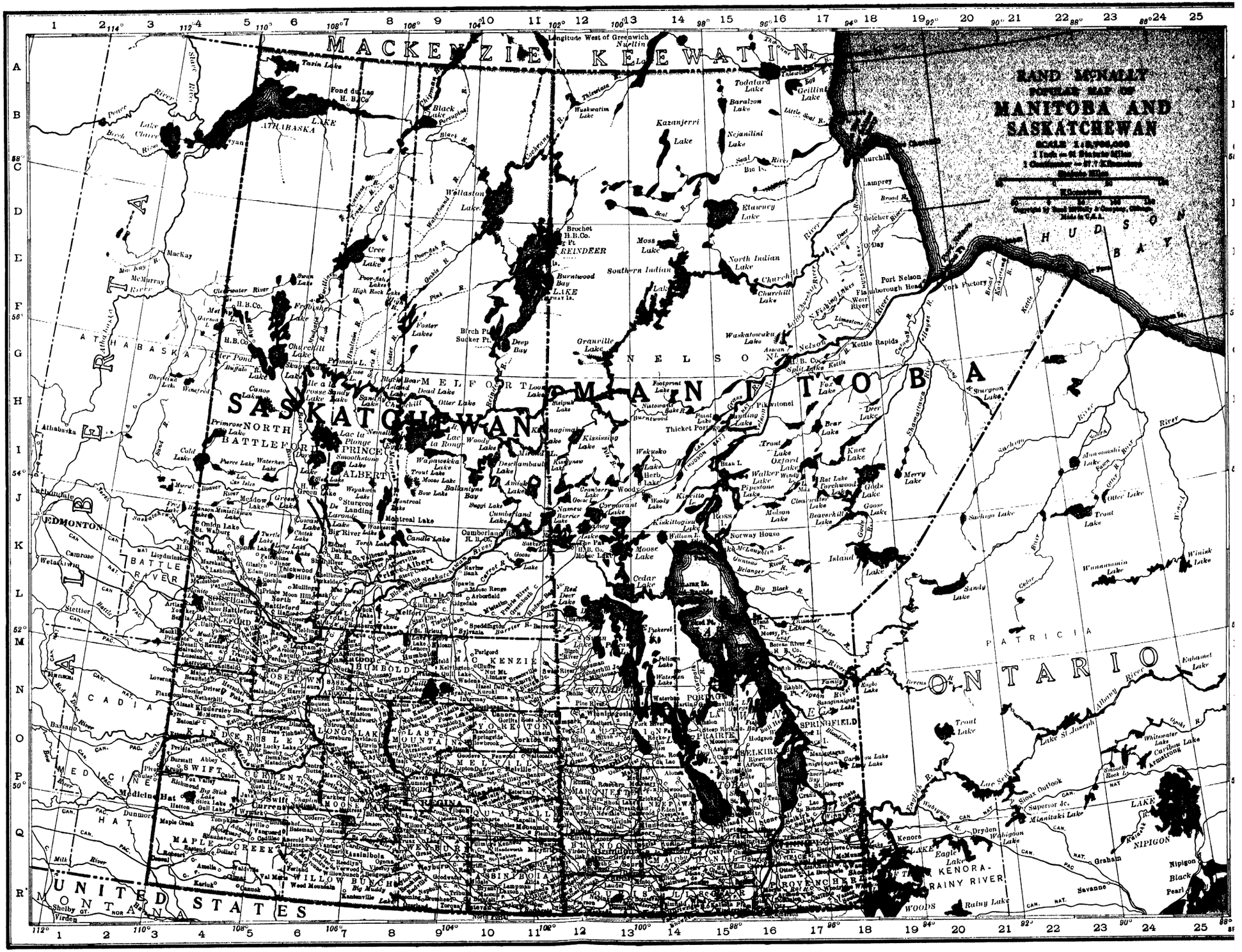
(Including Figures from Latest Population Estimates)

Pop.—Thousands

1 Assiniboia..Q 7
1 Battleford..L 5
2 Biggar....M 5
1 Canora...N 11
3 Estevan...R 10
1 Herbert...P 6
2 Humboldt...M 8
1 Indian Head P 9
2 Kamsack...O 11
1 Kindersley..N 5
1 MapleCreek P 4
2 Melfort....L 9
4 Melville...O 10
21 Moose Jaw..P 8
6 North Battleford....L 6
10 PrinceAlbert.L8
1 Radville...R 9
53 Regina....P 9
2 Rosetown..N 5
1 Rosthern...L 7
43 Saskatoon..M 7
2 Shaunavon..Q 5
1 Sutherland..N 7
5 SwiftCurrent P5
1 Tisdale....L 9
1 Watrous...N 8
5 Weyburn...Q 9
1 Wilkie....M 5
1 Wynyard...N 9
5 Yorkton...O 11

Pop.—Hundreds

6 Arcola....R 11
9 Broadview.P 10
6 Cabri.....P 5
5 Carnduff..R 11
6 Craik.....O 7
6 Davidson...O 7
5 Foam Lake.N10
9 Grenfell...P 10
9 Gull Lake...P 5
9 Kerrobert..M 4
5 Kinistino...L 8
6 Leader.....O 4
5 Lumsden...P 8
5 Neudorf...P 10
7 Outlook....N 6
6 Oxbow....R 11
2 Qu'Appelle..P 9
5 Saltcoats..O 11
6 Star City...L 9
5 Strasbourg..O 8
8 Unity.....M 4
6 Wadena....N 9
5 Wapella...Q 11
6 Whitewood P 11
9 Wolseley..P 10



MANNHEIM, the largest city in the Prussian province of BADEN, one of the most important industrial and commercial cities in southwest Germany and the last Rhine port for large steamers. It is situated at the junction of the Rhine and Neckar rivers, about 43 mi. southwest of Frankfort. Its development began in the 17th century, when Frederick IV made it a refuge for Protestant exiles from Holland. Except for the small circular inner city, it is laid out like a chess board. The Jesuit Church and the former electoral palace of the 18th century are of interest. The latter, with its courts, stables and other buildings and its 1,500 windows, is one of Germany's largest. The most important products are metal goods, ships and machines, and trade is chiefly in grain, fodder, flour, coal and petroleum. Pop. 1925, 247,486.

MANNING, WILLIAM THOMAS (1866-), American bishop, was born at Northampton, England, May 12, 1866. He studied theology in the United States, receiving his bachelor's degree from the University of the South in 1893, and his doctorate from the University of Nashville in 1901. Bishop Manning served as rector at Redlands, Cal., Lansdowne, Pa., Nashville, Tenn., Trinity Parish, New York City, and was professor of dogmatic theology at the University of the South from 1896 to 1898. He was consecrated bishop of New York in 1921.

MANNOSE, a sugar, having the formula $C_6H_{12}O_6$, very closely related to DEXTROSE or GLUCOSE, which occurs principally in substances termed mannosans. These mannosans are converted to mannose by acid treatment in the same way as starch is converted to glucose.

MANNYNG, ROBERT or **ROBERT OF BRUNNE** (c. 1264-c. 1340), English poet, was born in Brunne, now Bourne, Lincolnshire, about 1264. In 1288 he entered the Gilbertine monastery at Sempringham where he wrote *Handlyng Synne,* 1303, a free translation of the *Manuel des Pechiez* by William of Waddington. His *Story of Inglande* follows the older English chronicles. Mannyng died about 1340.

MAN-OF-THE-EARTH (*Ipomœa pandurata*), a trailing or somewhat climbing perennial of the morning-glory family called also wild sweet-potato vine. It grows in dry soils from Connecticut to Michigan and southward to Florida and Texas, often becoming a troublesome weed; it is sparingly planted, especially in double-flowered forms, for ornament. The plant takes its name from the huge long roots, sometimes weighing 20 lbs., from which rise slender stems, 2 to 12 ft. long, bearing heart-shaped or fiddle-shaped leaves and large showy white flowers.

MANON, an opera in five acts by JULES MASSENET, libretto after a story of Abbé Prevost by Meilhac and Gille; première, Paris, 1884, London and New York, 1885. One of the most effective of Massenet's operas, it is securely entrenched in the standard repertory of opera.

On her way to a convent where she plans to finish her education Manon, a pretty country girl, meets the Chevalier des Grieux. He falls in love with her and they elope, going to Paris. His funds prove inadequate to supply her needs, which are extravagant, and she presently elopes with a wealthy nobleman, De Brétigny. Learning that her first lover has become despondent, she returns to Des Grieux who now attempts to win a fortune by gambling. He wins heavily and is accused of cheating by Guillot de Morfontaine, a public official and roué who has had his eye on Manon; Manon herself is accused of being a dissolute woman. Des Grieux is arrested and Manon exiled. The Count des Grieux, father of the Chevalier, intervenes and saves his son from prison, and the latter seeks out his old sweetheart, who dies in his arms.

MANON LESCAUT, an opera in four acts by GIACOMO PUCCINI, libretto based on Abbé Prevost's novel by Puccini and several of his friends; première, Turin, 1893, London and Philadelphia, 1894, New York, 1898. The work has never attained the popularity of such successors as *La Bohème* and *Tosca,* although it still must be ranked among Puccini's more pretentious labors.

In front of an inn at Amiens, Manon, a young girl en route to a convent, is addressed by the Chevalier des Grieux, with whom she falls in love. The pair escape from Manon's brother, Lescaut, a sergeant of the king's guard's and his companion, Geronte, the treasurer-general. But the lovers are forced apart by poverty, and in despair Manon becomes the mistress of Geronte. At a dance Manon again meets Des Grieux, and the reunited lovers are surprised in an affectionate embrace by Geronte. Manon is arrested and put aboard a ship which is to take her to exile in America. The chevalier succeeds in getting aboard the vessel. In the final act the lovers are seen in search of shelter, in the vicinity of New Orleans. Des Grieux leaves Manon to seek water, and the weakened girl, believing herself deserted, resigns herself to death. Des Grieux returns and Manon dies in his arms.

MANOR, THE. In studying the countryside of medieval England after the Norman Conquest, two units of rural economy must be considered. The village is the more ancient of these, with its agrarian arrangements rooted in the remote past; the more recent is the manor, the result of feudal forces which began to mold English society before the Conquest, but reached their full efficiency only through the spread of the legal ideas and economic practices on which the military fief was based. The varying relations between village and manor help to make the latter an institution more easily described than defined. In some places for example, the territorial boundaries of village and manor coincided, and one lordship existed in the unit; elsewhere a manor extended over several villages and hamlets, and more often a village included two or more manors, territorially intermixed, but under several lordships. The essential difference between village and manor seems to lie in the presence of lordship in the latter and the changes thereby induced. The peasantry of England, especially in the south and west midland,

already depressed in social position by the Danish invasions and the resultant financial exactions, by the introduction of certain continental methods of exploitation and by the growth of private justice, were forced by the Norman kings and their successors into the mold of the military fief which depended for its support upon a dependent population cultivating the land and supplying the material needs of the lordship, whether knightly or ecclesiastical.

While many of the essential traits of manorial economy were substantially alike throughout England, there were yet more or less clearly defined types of manors and important differences among them. Vinogradoff finds already in *Domesday Book* five types. Writers in the past have been perhaps inclined to overemphasize the similarities of manorial structure, but increasing study of local variations is to-day correcting this tendency. The most clear-cut type of manor is that found generally in the middle and west of England. Here the village, nucleated in form, with its houses close together near the lord's manorial buildings, was surrounded by the arable land of the village, lying in three open fields in which the three-field system of husbandry normally prevailed, a triennial rotation of spring and winter crops and fallow. Light enclosures were made around the arable soil, within which all was open, the lords and tenants holding intermixed strips delimited from one another often by the space of an unplowed furrow. The very ancient shape and extent of these strips, an acre or half acre in long narrow rectangles, in the proportion of 4 roods or 2 roods to 40, was determined by the greatest economy of effort necessary for a day's plowing with the heavy plow of eight draught animals. The lord held a considerable number of these strips in demesne; the typical unfree villein or virgater held approximately 30 of them, acre or half acre, 10 in each field; free tenants held less uniform, more disintegrated tenements, small cotters either a small tenement of arable, or possibly small arrentations from the demesne. In addition to his strips of arable each villein had a bundle of customary rights in the pasture, meadows and wood and waste of the village for his cattle and for his chief estovers, to wit, hedgebote, housebote, and firebote.

A system of cooperative husbandry for the cultivation of the soil prevailed, the lord's strips being cultivated by the labor of the unfree. The main service of virgaters, tenants of land anciently arable, in this type of manor, was arranged either in the form of week work, labor services performed on certain days in the week, or of work by the task, *ad taschum*, where a certain number of works of specified kinds had to be performed in the demesne in appropriate seasons of the year. Where the week work was insufficient, as in the spring plowing and the harvest reaping, additional labor was asked by the lord, at first as a grace from the peasant, later as a requirement made by the lord. In memory of their origin such services were called *precariæ* or boon services. A gradual tendency may be noticed after the Conquest toward an increase in the amount of week work and boon work required. Where commutation for money took place, the week work was relaxed before the boon work. Free tenants sometimes paid all their rents in money, and sometimes paid part in labor agreed upon with the lord. Certain groups of tenants in given manors, called *censuarii* and *molmen*, might have their main services commuted and retain their unfree status. The amount of service due from the unfree was determined by the limits of economic expediency and embodied in the custom of the manor, not legally enforceable against the lord except in ancient demesne manors, such as those held by King Edward the Confessor on the day on which he was alive and dead. Tithes to the church formed another heavy burden.

In addition to labor services the peasants paid rents in money or kind, some of which were survivals of old dues, perhaps antedating the manorial economy, some old commutations of certain services. Other payments were made more or less clearly as recognitions of unfree status, like merchet and tallage at the will of the lord, and still others were in origin, public burdens. In manors of the type under discussion as well as in those of a more pastoral character much stress is laid on herbage for cattle, mast for swine and pasture for sheep, whose wool played so large a part in English medieval trade and industry. The history of medieval rights of common has yet to be written. It must take account of common of pasture within the village on the fallow, the stubble, and the waste, and customary wood rights and estovers in the village waste; it must also consider intervillar arrangements, the intercommoning of villages adjacent to and encircling great wastes or woods whose cattle, if levant and couchant on anciently arable tenements within the village, might be turned out without payment for all the year, to pasture freely, horn under horn. Cattle of villages outside the ancient circle might also be pastured, but only at limited times and in specified numbers and for a money payment. Dartmoor fenland and the woods of Essex offer good examples of pasture of this sort. There is much still to be learned of the development of the idea of the lord's control over the waste as over against the village, and the possible connection between districts in which intercommoning prevailed and the formation of administrative units like sokes or hundreds. The afforestation by the king of great stretches of woodland or waste, often with villages included, was unpopular not only because it subjected the inhabitants to a harsh forest law, but also because it tended to interfere with ancient customs of commons.

Another element of manorial organization of essential importance in manors of all types was the judicial, centering around the manorial court. The lord had jurisdiction over manorial matters and also exercised certain franchises, public or royal in nature, but now —an evidence of the inability of medieval thought to distinguish clearly between public and private rights —taken over into private hands. Sometimes the lord

held the hundred court as a franchise, claimed either by charter of the king or by prescription, and in it administered justice normally. The maintenance and growing strength of the king's justice administered in the king's courts in the face of extensive private jurisdiction is one of the main characteristics that differentiates English feudalism from continental.

Rural arrangements differing in important particulars from those already discussed appeared in other parts of England, having their origin in the different character of the countryside or different historical backgrounds. They are too numerous to be described in detail; examples may be cited of the particular set of customs in Kent which was strong enough at the time of the Conquest to resist the standardizing influence of the common law and to maintain in that county unique tenemental units, different customs of inheritance and the like, continuance of ancient gafol payments, absence of week work and tracts of swine pasture in the Weald at long distances from parent manors. The Danelaw too was rich in varieties of manorial organization, the sokes being of especial interest, and in East Anglia is shown the great lack of coincidence between village and manor, the general absence of three field arrangements, the more compact *tenementum* unit and the failure of lordship to prevent the disintegration of free tenements. Variations of another kind occurred on manors of ancient demesne, mentioned above, where certain classes of tenants were protected by special legal remedies. Other conditions existed in forest regions and in those where colonization was in progress; and in districts where, for whatever reason, isolated farms predominated over nucleated villages. Of great importance also in the study of different localities is the gradual intrusion of the conditions that caused the breakdown of the medieval system, such as the commutation of services, the increase in capital, the renting of the demesne, the stress on sheep raising and enclosures and the development of copyhold. Cause and effect are often difficult to distinguish.

In conclusion, a general word should be said of the classes of society already mentioned in the preceding discussion. The lord of the manor might stand high or low in the feudal scale, holding his particular lordship as part of a great feudal nexus elaborately organized, or as his sole estate. Free tenants within the manor sometimes themselves held of their lords by feudal service like scutage; others, tenants of large or small holdings, paid rents agreed upon with their lords which might carry with them certain services. Other tenants like the *censuarii* and probably the *molmen* are difficult to classify, but were probably unfree with almost all services commuted at some past time. Free men might hold land in villeinage and be subject to the obligations attached thereto, even while, for some generations at least, preserving their free status. The typical unfree peasants, the villeins, with tenements and services more or less uniform in particular manors were justiciables of their lord's court and unprotected in tenements and services against their lords except by the "custom of the manor," which, as has been said, represented the limit of profitable exploitation as exercised by the lords. The tests of free status were protection in the king's courts in other matters than personal injuries and certainty of service; in other words, service by agreements enforceable in the king's courts, as opposed to the customary arrangements of villeins, not so enforceable.

The economic arrangements thus described may in their main features be discerned fairly generally on the continent. Developments and differences are necessarily present in a society so extended in time and space. In general the European estate or economic unit was somewhat less closely integrated than the English, but here too feudal forces tended towards a certain uniformity. Field systems like those of England prevailed. The great *defrichement,* or assarting, occurring in the period after the late Carolingians was a considerable factor in economic life, and also the very important colonizing activities along the German borders. Arrangements for pasture in the intervillar wastes and in the uncultivated parts of villages were important in all regions. The collective husbandry which most of these processes engendered was regulated, as in England, by village custom and the needs of exploitation of the lord's demesne as carried on by peasants.

It is of interest to note that in France domanial arrangements were in time largely superseded by the system of *métayage,* where small plots paid their service not in *corvées* and week work or work *ad taschum,* but in the render of a proportional part of their crops, marks of serfdom from servile tenants, like *formariage, taille* and *chevage,* remaining. Justice over peasants was generally all in the lord's hands in France, public courts functioning only rarely. In Germany the intrusion of the *ministeriales,* often in origin servile manorial bailiffs and the like, helped to give the German *Grundherr* "a most confusing complex of social groups to deal with." The essential traits and variations of European agrarian life in the Middle Ages offer a fascinating and still fruitful field of work for the economic historian. N. N.

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MAN-O'-WAR BIRD, a name often given by sailors to the FRIGATE BIRD, a large seabird of powerful flight, related to the gannets and pelicans, which lives largely by pursuing other seabirds and robbing them of their catch of fish.

MANROOT (*Echinocystis fabacea*), a trailing perennial vine of the gourd family found in hills and

mountains in central California. The usually smooth stems, 12 to 30 ft. long, rise from a huge, deep-seated root sometimes equaling a man's body in size and somewhat resembling it in form. The stem bears branched tendrils, thin, ivy-shaped, lobed leaves,



FROM JEPSON MAN FL PLANTS CALIF . COPYRIGHT

MANROOT

Fruit, flowering branchlet and pistillate flower

greenish-white flowers in axillary clusters, and densely spiny, globose fruit, 2 in. in diameter, at first fleshy, but at length dry and bursting irregularly.

MANSARD or **MANSART, JULES HARDOUIN** (1646-1708), French architect, was born at Paris, Apr. 16, 1646. His early work immediately distinguished him, and he came under the patronage of Louis XIV, which he enjoyed for the rest of his life. He was a facile and able designer and a thorough and rapid superintendent of construction and became the undisputed master of French Baroque. Mansard built the palaces of Cluny, Marly, the Great Trianon, the parish church of Versailles, the Pont Royal and the dome of the Invalides, both at Paris, and numerous private houses. His masterpiece is the main building of the palace of Versailles. He died at Marly, May 11, 1708.

MANSART, NICOLAS FRANÇOIS (1598-1666), French architect, was born in Paris, Jan. 23, 1598. He designed numerous public and private buildings, and is credited with having brought the "mansard" roof into popular favor. His many works include the Hôtel Carnavalet, Hôtel de la Vrillière, Château de Maisons at St. Germain-en-Laye, Hôtel Mazarin, and the Château de Maisons-sur-Seine for Louis XIV. He died in Paris, Sept. 23, 1666.

MANSFIELD, KATHERINE (1890-1923), pen name of Katherine Beauchamp Murry, British author, who was born at Wellington, New Zealand, in 1890, the daughter of Sir Henry Beauchamp. Her girlhood was spent in New Zealand. Going to London in her latter 'teens she entered literary work, was associated with JOHN MIDDLETON MURRY, author and critic, in a literary venture, and married him in 1913. She developed many fine gifts, especially marked being her brilliant talent for writing short stories, of which she published three volumes, *Bliss, The Garden Party* and *The Dove's Nest.* A volume of poems, and her posthumously published *Journal, 1914-22* and *Letters* completed her sum of achievement. The writer died at Fontainebleau, France, Jan. 9, 1923.

MANSFIELD, RICHARD (1857-1907), American actor, was born on the island of Heligoland, in the North Sea, May 24, 1857. After receiving his education in England he came to America, served as a musical and dramatic critic, returning to Europe in 1875 to study painting. Mansfield's New York début was at the Standard Theatre, 1882, in *Les Manteaux Noirs.* His principal successes were *Prince Karl, Dr. Jekyll and Mr. Hyde,* 1886, *Richard III, Beau Brummell, Merchant of Venice, Arms and the Man, The Devil's Disciple,* 1897, *Cyrano de Bergerac, Henry V, Monsieur Beaucaire, Julius Caesar, Old Heidelberg* and *Peer Gynt,* 1906. As producer he was remarkable for his elaborate staging. A character actor of great vividness and distinction, his career was notable for his proficiency in both tragedy and comedy rôles. He died at New London, Conn., Aug. 30, 1907.

MANSFIELD, a municipal borough and railway junction of Nottinghamshire, England, situated on the River Maun at the edge of Sherwood Forest, 142 mi. northwest of London. Mercian, and, later, Norman kings made it a favored resort, and in 1808 Lord Byron lived for a while in Newstead Abbey, a handsome dwelling inherited from his uncle. Among the town's antiquities are the Early Norman Church of St Peter, and a grammar-school. Mansfield manufactures machinery, threads and laces. Coal mining, quarrying, iron-founding and brewing are also carried on. Pop. 1921, 44,416; 1931, 46,075.

MANSFIELD, a town of southeastern Massachusetts, in Bristol Co., situated on the New York, New Haven & Hartford railroad 24 mi. southwest of Boston. In a farming region, it is market center for garden products. Manufactures include jewelry, machine shop tools, chocolate and drawn steel. Mansfield has many greenhouses, which are well known for their gladioli. Pop. 1926, 6,255; 1930, 6,364.

MANSFIELD, a city of northern Ohio, the county seat of Richland Co., situated about 70 mi. southwest of Cleveland. Among the transportation facilities are the Erie, Pennsylvania and Baltimore and Ohio railroads, bus lines and a municipally-owned airport. The city has an elevation of 1,200 ft. and is surrounded by hills. The manufactures include sheet steel, novelty furniture, electrical devices, brass goods, tires and stoves. In 1929 the value of the factory output was about $37,000,000; the retail trade amounted to $23,357,910. Mansfield owns its water works and sewage-disposal plant. The Ohio State Reformatory is located in the city. Louis Bromfield, the novelist, was born

in Mansfield and describes it in *The Green Bay Tree.* John Sherman, former Secretary of the Treasury, resided here.

The town was laid out in 1808 and named for Lt.-Col. Jared Mansfield. Twenty years later the settlement was incorporated as a village and in 1857 became a city. Pop. 1920, 27,824; 1930, 33,525.

MANSHIP, PAUL (1885-), American sculptor, was born at St. Paul, Minn., Dec. 25, 1885. He studied in New York, Philadelphia and Europe. In Italy he was much affected by the art of MICHELANGELO and DONATELLO. This influence is felt in the delightful marble bust of the sculptor's three-weeks-old daughter Pauline, in the Metropolitan Museum. Archaic Greek and Indian art influences are noticeable in such works as the *Duck Girl* in Fairmount Park, Philadelphia, and *Dancer and Gazelles.* In the more recent Memorial Tablet to J. P. Morgan, in the Metropolitan Museum, and *Yawning,* in the St. Paul Institute, Manship strikes a more modern note.

MANSION HOUSE, in London, opposite the Bank of England, the official residence of the Lord Mayor of London. The house was built of Portland stone in 1739-53, after designs by George Dance the Elder. Its portico, supported by six fluted Corinthian columns, is crowned by a substantial pediment the tympanum of which is sculptured in high relief with a female figure representing the City of London. In the Egyptian Room, 90 ft. by 60 ft., the various state banquets are held.

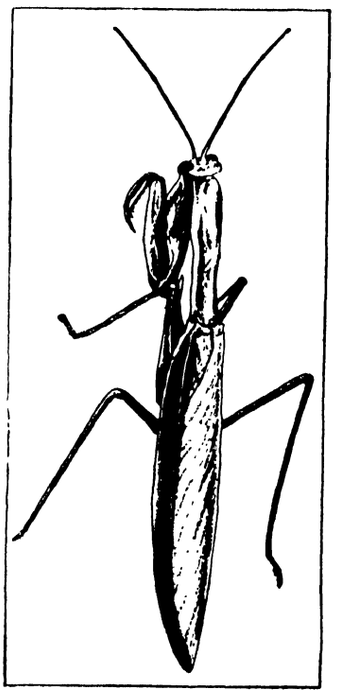
MANSLAUGHTER, the unlawful killing of a human being without malice. Manslaughter is said to be voluntary or involuntary. There is voluntary manslaughter where one person kills another in the heat of passion upon provocation. Involuntary manslaughter is a killing while in the commission of an unlawful act not amounting to a FELONY, or through negligence.

MANTEGNA, ANDREA (1431-1506), Italian painter and engraver, was born near Vicenza in 1431. He was brought up at Padua, where he came under the influence of both Squarcione and Jacopo Bellini. Squarcione's characteristic love cult of the antique is felt in the series of frescoes in the church of the Eremitani, Padua, which are more like sculpture than painting. The nine tempera paintings of the *Triumph of Caesar,* now at Hampton Court, England, were executed for Ludovico Gonzaga of Mantua, whom Mantegna served as court painter. They also show the painter's concern with Roman architecture and classic detail, but are less cold and severe than the Eremitani frescoes and are considered his masterpiece. Of Mantegna's easel pictures, the best known are the charming *Madonna della Vittoria,* in the Louvre, Paris, and the *St. George,* in the Academy, Venice. The painter died at Mantua, Sept. 13, 1506.

MANTELL, ROBERT BRUCE (1854-1928), American actor, was born at Irvine, Ayrshire, Scotland, Feb. 7, 1854. He made his first professional appearance as the sergeant in *Arrah-na-Pogue* at Rochdale, Lancs., in 1876. Subsequently he acted with Charles Calvert, Barry Sullivan and Samuel Phelps. He came to America in 1878 and, after supporting MODJESKA for a season, made a notable success as Boris Ipanoff in Fanny Davenport's production of *Fedora,* by SARDOU. From 1903 until the year of his death he toured the country in Shakespearian repertoire. He was also well received in the romantic rôles he played in *Monbars,* 1888, *The Corsican Brothers,* 1890, and *The Marble Heart,* 1891. He died in Atlantic Highlands, N.J., June 28, 1928.



MANTIS, large insects of the family *Mantidæ,* related to grasshoppers and crickets but predacious in their feeding habits. They are also called soothsayer, mule killer, devil-horse, rear horse or camel-cricket. The great majority of species are tropical but a few are native to the southern United States. The range of one species extends as far north as southern New Jersey. The European species (*Mantis religiosa*) has become acclimated in central New York. An Asiatic species (*Paratenodera sinensis*) also has been introduced and is often found near Philadelphia. None are harmful to man, animals or plants. All are helpful in destroying other insects.



PRAYING MANTIS

MANTIS-FLY, a popular name for North American species of insects, of the family *Mantispidæ.* They are closely related to the lace-wing flies, ant-lions, and dobsons, all of the order *Neuroptera.* In form and in habit the adults somewhat resemble various species of Mantis of the order *Orthoptera,* being provided with powerful forelegs fitted for seizing prey which consists of insects. So far as their habits are known the larvæ are parasitic on spiders and wasps in whose nests they live. Here they devour the young and pupate in silken cocoons.

MANTUA (Italian *Mantova*), a city of north central Italy, capital of the province of the same name. It borders on three small lakes and is surrounded by marshy land to the southwest. Noteworthy buildings are the cathedral, the 15th century basilica of Sant' Andrea, one of the finest of Renaissance edifices, the ducal palace of 1302 and the 16th century Palazzo del Te. VIRGIL was born in

Mantua. The modern city has advanced and technical schools, a seminary, public library, observatory, botanical gardens and mineralological museum. Among the manufactures, agricultural machines are prominent; there is also important trade in rice and grain. Pop. with suburbs, 1931, 42,939.

History. Mantua was conquered by the Romans in 222 B.C. and by the Lombards in the 6th century. It was ruled by ecclesiastical officials in the 9th century but in the eleventh became the possession of a temporal lord. After a period of numerous governmental changes it succumbed in 1328 to the rule of the Gonzaga family which maintained itself in power until 1707. It then became a fief of the Holy Roman Empire and except for the temporary domination of the French during the Napoleonic era, it remained under the jurisdiction of the Austrians until 1866 when it became part of the Italian Kingdom.

MANUAL TRAINING, in its original sense, was training in handicrafts such as carpentry, machine work, sewing and cooking. It is more generally referred to to-day as industrial arts training and has come to be accepted as training in the wide range of vocational subjects not covered by agricultural or professional education. The first aim of instruction in manual arts was to train the hand and eye and help shape the student's character. The tendency in recent years has been to break away from the disciplinary view of the work to a recognition of its actual vocational value.

The manual training movement had its beginnings in Europe and was particularly strong in Sweden. In the United States the Ethical Culture Society of New York founded the Workingman's School in 1878 and included instruction in the manual arts. In 1880 the St. Louis Manual Training School was opened as part of Washington University, and its success was so marked that other manual training schools were opened shortly in several large cities. Massachusetts passed a legislative act in 1895 requiring all cities of over 30,000 to teach manual training in their high schools. Manual work is included to-day in public elementary and secondary schools the country over, and during the past two years there has been a marked increase in enrollment in these courses where they are elective. The trade and industrial courses have over 50% of those enrolled in vocational courses, about one-fourth of these students taking their work in evening schools. M. R.

See United States Bureau of Education *Bulletin*, 1930, No. 16; *Educational Yearbook*, 1928, of the International Institute, Teachers College.

MANUFACTURES, CENSUS OF, an official count of the manufacturing establishments, including such items as the number of wage-earners, wages paid, cost of materials, value of products and the value added by manufacture. In the United States the first census of manufactures was taken in 1810 in connection with the regular census. Another was taken in 1820. In the 1830 census the data on manufacturing were entirely omitted, but were included again in 1840. The data of these early censuses were both inaccurate and incomplete, and the first really scientific enumeration of manufactures and relevant facts was made in 1850. The censuses up to and including that of 1900 dealt with production of industry regardless of the importance of the producer, but after 1900 they were restricted to factories whose products were valued at $500 or more, this step being taken to reduce the expense. Another change made at that time was to take the census every five years instead of every ten. In 1921 the period between censuses was reduced to two years and the minimum product value of industries covered was raised to $5,000. The census taken during 1930 covered the industrial activities of 1929.

MANUFACTURING PRODUCTION. *See* PRODUCTION, CENSUS OF.

MANURES, ARTIFICIAL. *See* FERTILIZERS.

MANUSCRIPTS, ILLUMINATED. *See* ILLUMINATED MANUSCRIPTS.

MANUTIUS, ALDUS or **ALDO MANUZIO** (1450-1515), famous Latin printer, was born in 1450 at Sermonetta, Italy. In 1489, at the suggestion of Prince di Carpi, he established himself in Venice where he organized the famous Aldine printing press to promote humanistic studies. In 28 so-called "editiones principes" the first prints in Greek letters were made and Greek scholars undertook the revision of the texts. He invented the so-called Italic type face. Altogether more than 130 volumes came from this press. He died at Venice, Feb. 6, 1515.

MANVILLE, an industrial borough of Somerset Co., N.J., located on the Raritan and Millstone rivers 35 mi. southwest of New York City and 8 mi. northwest of New Brunswick, N.J. It is served by the Central Railroad of New Jersey, the Lehigh Valley and Reading railroads, motor bus lines and electric trolleys. It is an important world center in the manufacture of asbestos products and has a number of other industries including creosoting and the manufacture of food products, cork insulation, boxes and clothing. Pop. 1930, 5,441.

MAN WITHOUT A COUNTRY, THE, a didactic tale of patriotism by EDWARD EVERETT HALE; published 1863. This is the pathetic history of a fictitious American officer, Philip Nolan, who becomes a traitor under the influence of Aaron Burr, and is condemned to follow his own life sentence of "never again hearing of the United States." From the moment of his rash utterance Philip Nolan is forced to travel first on one ship, then on another, never seeing or hearing of his native land, self-condemned until the last hour of his life to be indeed a "man without a country."

MANX, a language of the Goidelic branch of the CELTIC linguistic group of INDO-EUROPEAN, spoken by an ever-decreasing number in the Isle of Man. It stands in closer relation to Middle and Modern Irish and Scots Gaelic than to Old Irish (*see* IRISH), but diverges from them in loss of inflection, which tends to be replaced by periphrastic forms, as in a new

present of the type "'tis I (that am) losing" and a complete passive of the type "I am lost."

BIBLIOGRAPHY.—J. Kelly, *Practical Grammar . . . of Manks,* 1870.

MANZANILLO, a city of Cuba, situated on the southwest coast, about 112 mi. northwest of Santiago. Facing the Bay of Manzanillo, it is the port of entry for the surrounding district and a port of call for ships. The residential section is on a hill 200 ft. above the lower part, and has some attractive parks, in which stand statues of national heroes. Three rivers, the Cuato, the Yara and the Buey, empty into the bay here. The chief occupations are exporting sugar, hides, honey, tobacco and fine woods, products of the surrounding district. Before its foundation in 1784, it was a rendezvous for pirates, who sought refuge here to repair their ships. In 1792 Manzanillo was demolished by the French, in 1827 it was opened for foreign trade, and in 1833 it was granted its own government. Pop. 1928, 24,670.

MANZANITA, a genus (*Arctostaphylos*) of evergreen shrubs of the heath family. There are about 30 species, native chiefly to the western United States, 25 of which are found in California. They grow usually from 3 to 10 ft. high with very crooked branches, dark red or chocolate colored, smooth and



FROM JEPSON, MAN. FL. PLANTS CALIF., COPYRIGHT

MANZANITA

(Arctostaphylos Manzanita). Section of flower, flowering branchlet and fruit

highly polished bark, thick, entire, somewhat vertical leaves and small, white or pink, heather-like flowers in terminal clusters. The small berry-like fruit in form and color somewhat resembles a tiny apple, giving rise to the Spanish name manzanita. Many species, some exceedingly handsome, are characteristic shrubs of the chaparral belt.

MANZONI, ALESSANDRO FRANCESCO TOMMASO ANTONIO (1785-1873), Italian novelist, was born in Milan, Mar. 7, 1785. He studied at Milan and Pavia, and his views as a youth were exceedingly revolutionary. His revolutionary ardor was soon transferred from the political to the literary field and in 1819 he produced *Il Conte di Carmagnola,* a tragedy defying the traditional dramatic unities and amounting to a theatrical reformation; the play has been highly praised by Goethe. In 1827 appeared I Promessi Sposi, or *The Betrothed,* a classic novel of Milan in the 17th century. This work alone has placed Manzoni at the head of the Romantic School in Italy. The profoundly religious atmosphere of his writings has exercised a moral influence of incalculable value, and in the latter half of his life Manzoni was the recognized intellectual leader of Italy. The writer died in Milan, May 22, 1873.

MAORIS, primitive inhabitants of New Zealand, belonging to the Polynesian branch of the Malay family. These people migrated to New Zealand by canoe from various islands in the southern Pacific during a period of several hundred years. The migrations ended in 1350 with a fleet of canoes from Tahiti and these latest voyagers constituted the most influential factor in the earlier cultural development and social organization of New Zealand. Legends telling the story of these early voyages, as well as the lengthy genealogies which have been preserved by the learned men of the tribes, have provided valuable information when compared with similar records of other Pacific islands. When the first white men arrived the Maoris were in a comparatively advanced state of barbarism. An intricate system of *tabu* was closely associated with religious beliefs and was an important element in maintaining law and order. The people were industrious agriculturists and also obtained food by trapping and snaring small animals and birds and by fishing. They were famous for their elaborate tattooing and various ornamental arts, particularly carving. The Maoris are a vigorous and warlike people. Before the coming of the Europeans there was almost constant fighting between tribes. They stubbornly resisted English domination, the most important uprisings occurring in 1863-64. More recently they have become friendly. At first they resisted the inroads of civilization, but they are rapidly losing their native characteristics and are intermarrying so extensively with Europeans that they will eventually be absorbed.

MAP or **MAPES, WALTER** (c. 1140-c. 1210), medieval author and satirist, was born of a Welsh family in Hertfordshire, about 1140. He studied in Paris between 1154 and 1160 and served as an itinerant justice under Henry II. In 1197 he was made Archdeacon of Oxford. Much of the satirical or goliardic verse of the 12th and 13th centuries was probably written by Map. Also an Anglo-French poem on which *Lancelot* is based is generally accredited to him, but the only authentic work by Map is the *De Nugis curialium,* or *Courtiers' Triflings,* written between 1182 and 1192. Map died about 1210.

MAPLE, a genus (*Acer*) of valuable timber and ornamental trees of the maple family. There are about 100 species widely distributed in the Northern Hemisphere, a single species extending south of the Equator to Java. Thirteen species, together with several varieties, are native to North America, forming in the eastern United States and adjacent Canada an important part of the deciduous forests.

The maples are mostly medium-sized to large trees with abundant watery or sugary sap; a few are shrubby or vinelike. They bear round branches; long-stalked, palmately lobed or rarely pinnately divided opposite leaves; small regular flowers and a characteristic fruit (samara) composed of two nutlike carpels, each provided with a veiny membranous wing. The flowers are borne in close clusters blossoming before the leaves, as in the red maple (*A. rubrum*); in flat clusters at the same time as the leaves, as in the sugar maple (*A. saccharum*), or in narrow clusters appearing after the leaves, as in the mountain maple (*A. spicatum*).

Of the native maples found in the United States and Canada nine grow east of the Great Plains, two are found only on the Pacific coast, and two are widely distributed in the Rocky Mountain region. The eastern species comprise the hard, the soft, and the mountain maples and also the ash-leaved maple or Box Elder, which extends in several well-marked varieties from New England to Alberta, Texas and California. The most important American species is the sugar, hard or rock maple (*A. saccharum*), sometimes 120 ft. high, found from Newfoundland to Georgia and westward to South Dakota and Texas. It produces very valuable timber, is the main source of maple sugar, and is widely planted for shade and ornament. The heavy, close-grained timber is one of the best of American hard woods, the forms called curly, wavy and bird's-eye maple being extensively used for interior finish and cabinet work. The black maple (*A. nigrum*), very similar in appearance, qualities and range, is also highly valued. Two small hard maples, the white-barked maple (*A. leucoderme*) and the southern sugar maple (*A. floridanum*) occur in the southern states. The soft maples comprise the red or swamp maple (*A. rubrum*), with conspicuous red foliage in autumn, and the white or silver maple (*A. saccharinum*), with deeply lobed leaves silvery white below. Both attain about the same size as the sugar and black maple and extend over a similar range. They are extensively utilized for quick shade and soft-wood timber.

The dwarf maple (*A. glabrum*), and the bigtooth maple (*A. grandidentatum*) are unimportant trees of the Rocky Mountain region. The Pacific coast species include the bigleaf maple (*A. macrophyllum*), an important timber tree, with leaves sometimes 10 in. broad, and the vine maple (*A. circinatum*), sometimes prostrate or creeping but commonly a small tree.

Many Old World maples in numerous handsome foliage varieties are grown in America as ornamentals, especially the Norway maple (*A. platanoides*), the sycamore maple (*A. Pseudo-Platanus*) and the Japanese maple (*A. palmatum*).

In 1930 the cut of maple lumber in the United States amounted to 601,218,000 board ft. valued at the mill at $20,711,960.10, Michigan producing 39% and Wisconsin 25% of the total. A. B. J.

MAPLEWOOD, a city in St. Louis Co., eastern Missouri, situated just west of St. Louis. It is a residential suburb, served by the Missouri Pacific Railroad. The retail business in 1929 amounted to $4,457,537. Pop. 1920, 7,431; 1930, 12,657.

MAPS, AERIAL. *See* Aerial Maps.

MAPS AND MAPPING. The essential requirements of a topographical map (*see* Topography) are that it shall show: 1. The most important physical features—water surfaces, vegetation, culture, and the important boundary lines—in correct relation to each other as projected on a horizontal plane, or on a level surface; and 2. The relief, or elevations of points above that surface. The scale, or the relation between a map distance and the corresponding ground distance, should be known. On maps made for special purposes everything may be omitted except that which it is desired to emphasize. As examples, railway maps, statistical maps, aviation and nautical charts, may be cited.

The framework used as the basis of a map usually consists of meridians and parallels of the earth drawn at some selected interval. The system of meridians and parallels shown on the map is known as a "projection." For large-scale maps rectangular co-ordinate axes are used. The map projections in most common use are: 1. the simple conic, in which the meridians and parallels are on a tangent cone. When this cone is developed it gives straight meridians radiating from a point, and concentric parallels cutting the meridians at right angles; 2. the polyconic, in which each parallel is developed on a different cone; the meridians are curved and cut the parallels at angles which are slightly less than right angles; and 3. the Lambert, having two standard parallels; the meridians are straight and the parallels concentric. Those projections having straight meridians will join perfectly at the east and west edges, whereas those having curved meridians will not. The polyconic is more accurate as regards scale when the map consists of a strip running north and south. The Lambert is more accurate when the strip extends east and west.

The relief, or form of the surface, is best shown by means of contour lines. A contour line is a horizontal curved line joining points having the same elevation. It is the line of intersection of the surface of the ground and a level surface; any shore line of still water is a contour line. The contour interval should be chosen with reference to the scale of the map, so that contour lines will not be too crowded or too far apart. Contours of hills or of depressions are closed loops. When contours are spaced closely the slope is steep; when far apart the slope is gentle. Contours not only show at a glance the form of the land, but they give definite elevations as well.

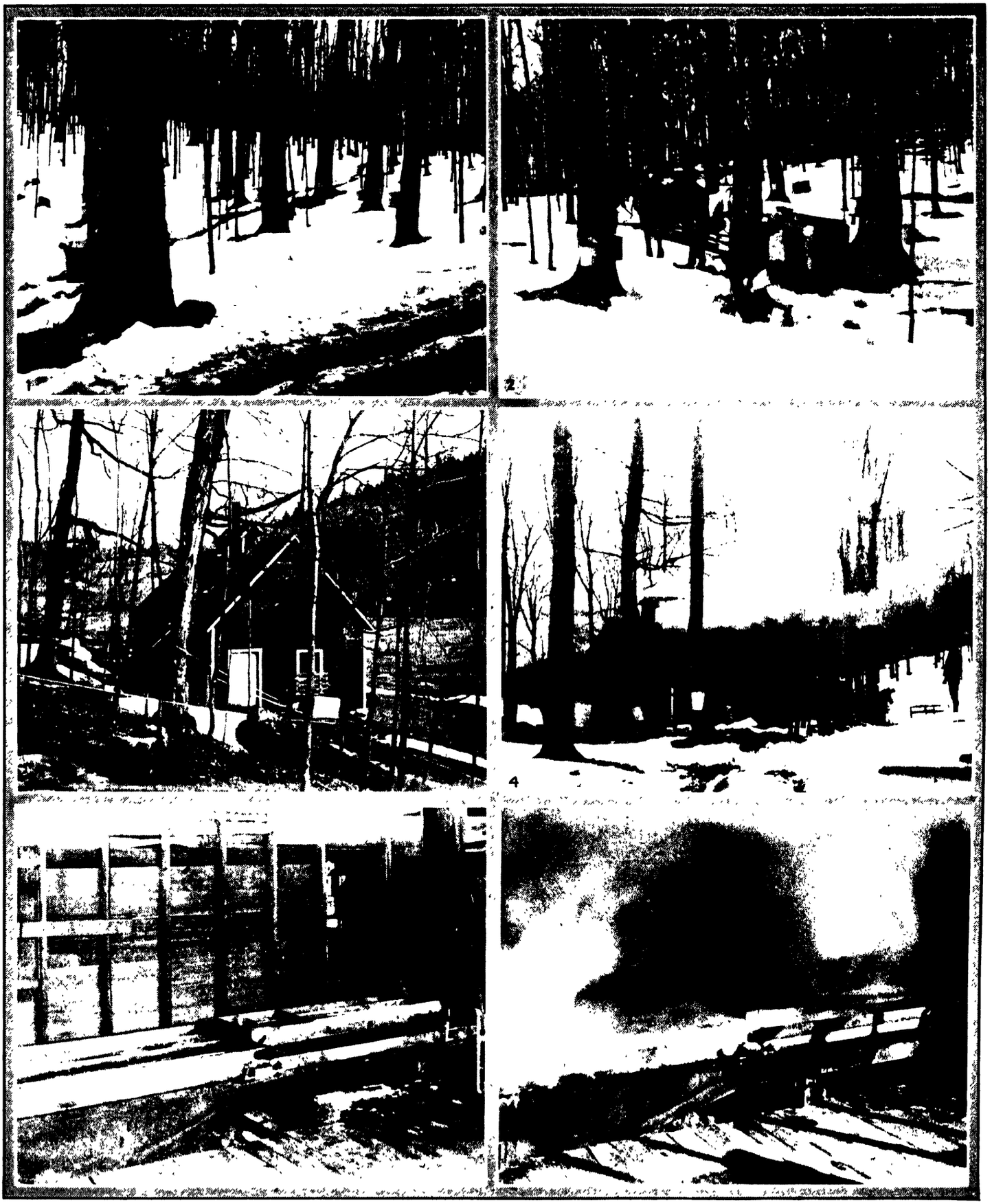
Relief is also shown by means of hachures; or shade lines, and sometimes by shadows. The hachure is a short straight line drawn in the direction of steepest slope, i.e., perpendicular to the contour. The width (weight) of the hachure line is greater for steeper slopes, the scale of slopes being arbitrary. Hachures aid in visualizing the topography and are ornamental, but they do not give information as to elevations.



PAINTED FOR THE NATIONAL ENCYCLOPEDIA BY MARY E. EATON

AMERICAN RED, OR SWAMP, MAPLE (*Acer rubrum*)

1. Pistillate flowers before the leaves in early spring. **2.** Staminate flowers before the leaves, early spring. **Center.** Leaves and fruit in early summer. **3.** Leaf after an autumn frost.



1, 2, COURTESY W. H. CROCKETT, BURLINGTON, VT.; 3, 4, 5, 6, CARY MAPLE SUGAR CO., ST. JOHNSBURY, VT.

A VERMONT MAPLE SUGAR FOREST

1. Maple sugar trees tapped and buckets in place to receive the sap. **2.** Collecting sap into larger containers. **3.** Pipe line system for collecting sap. Pipes from the trees run directly to the Sugar House. **4.** The Sugar House. Clouds of steam arise as the sap is boiled down. **5.** Evaporator. Freshly gathered sap circulates through its channels. A wood fire is built underneath and the sap is boiled down to the proper density. **6.** Evaporator in use. Forty gallons of sap are required to make one gallon of syrup, necessitating the evaporation of a great amount of moisture.

They are used also in the conventional symbols for slopes such as eroded clay or sand banks, or cuts and fills on railway or highway lines.

The chief methods used in making maps are: Triangulation, or traverse, and precise, or first-order, LEVELING for the control survey; Stadia traverses or plane table surveys, and photography, for the mapping of topographic details; Sounding locations by TRANSITS at the ends of a base-line, or by two SEXTANT angles from a boat, or by sound ranging for HYDROGRAPHIC SURVEYING.

Much topography is now obtained from photographs, both ground and aerial. In Canada the Rocky Mountain regions were surveyed chiefly by photographs taken from the ground. In the flat lake regions of the north the method employing oblique aerial photographs is used extensively. In the U.S. the plane-table method is the one most used. In railway and highway surveys the topography is taken with the hand level. The barometer is used to supplement other instruments and methods. *See also* SURVEYING.

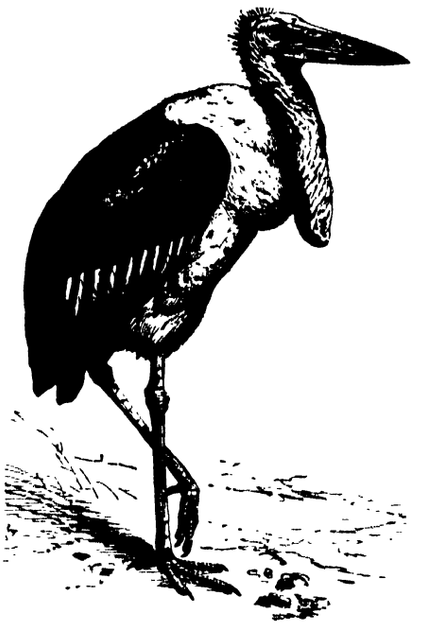
G. L. H.

MAPU, ABRAHAM (1808-67), Hebrew novelist, was born in Kaunas, Lithuania, Jan. 10, 1808. Here he received his early education. He was the first to introduce the novel into modern Hebrew literature. His *Ahabat Tziyon,* or *Love of Zion,* which appeared in 1853, is a romance of the days of Isaiah. It is still popular among Hebrew readers, and translations into many tongues are available. His *Ashmat Shomron,* or *Guilt of Samariah,* published in 1865, is a powerful romance depicting the social conditions of Samaritan society in Biblical days. His *Ayit Tsabua,* or *The Hypocrite,* deals with Jewish life in his own day. It appeared in 1857-61. By profession Mapu was a teacher, and he was the author of a number of text-books. He is often spoken of as the father of the Hebrew novel. He died in Koenigsberg, Prussia, Oct. 9, 1867.

See N. Slouschz, *The Renascence of Hebrew Literature,* 1909.

MARABOU, a very large bird (*Leptoptilus crumenifer*) of the stork family (*Ciconiidæ*), found widely throughout tropical Africa and called also African adjutant. Though smaller in size it is similar in appearance and habits to the Indian ADJUTANT, and like it, acts as a scavenger in towns and villages. The marabou has very long legs, an enormous sharp pointed bill, naked head and neck, with a huge inflatable pouch on the throat, and generally white plumage with the back and wings slate color. From the lower tail coverts are obtained the delicate downy feathers, known as marabou plumes, long prized for ornamentation. The marabou, which is easily domesticated, is gregarious in the wild state, frequenting marshes along rivers and devouring immense numbers of various small animals which it swallows whole.

MARABOUTS, the French form of the Arabic *murabitun,* devotees, ascetics, holy men of Moslem north Africa, especially of Berber stock. They are highly regarded as guides in religion and are very influential in social and political affairs. Many are remembered as saints after death, and worshiped at their tombs. The word originally referred to one keeping guard at a look-out (*marba'*) where special merit might be won in warfare against unbelievers. Under the marabouts as leaders the Berbers once established a vast empire in north Africa and Spain, first as the



MARABOU OR ADJUTANT

Almoravides, 1056-1147, and immediately thereafter, 1130-1269, as the Almohades, from *muwahhad,* or believing in the unity of God.

MARACAIBO, a port of Venezuela, on the west shore of a connecting channel between Lake Maracaibo and the Gulf of Venezuela. The city has good wharfs on a beautiful bay and a smooth roadstead 30 ft. deep; unfortunately, however, the sand bar at the entrance of the channel confines the passage to ships drawing only 11 ft. A large part of the exports are transshipped to larger vessels at the island of Curaçao, not far distant. Not only is Maracaibo an important port for the petroleum and coffee shipments of the hinterland but it also receives and ships large quantities of coffee from the Cucuta district of Colombia. Maracaibo is in many ways a modern city, though there are no public buildings of particularly striking appearance. The legislative and municipal palaces and a spired church are the most noticeable structures. Manufactures include candles, soap, hats, shoes, leather and lumber products. These commodities command a sale in Colombia as well as in Venezuela. Pop. 1924, 51,255.

MARACAIBO LAKE, a lake of Venezuela which communicates with the Gulf of Venezuela by a short channel nearly 9 mi. wide. A bar at its outlet prevents large vessels from entering. The lake is rectangular in shape, with a length of 137 mi., a breadth of 75 mi. and an extreme depth of 500 ft. Maracaibo is the largest sheet of water in South America. It is

so far landlocked that tides are scarcely felt inside the bar. A little beyond this bar its waters are fresh, the amount it receives from the surrounding streams being greatly in excess of the marine currents. In the region surrounding the lake, sanitary conditions must be improved considerably if the district is to increase greatly in population; malaria is a constant menace and the percentage of intestinal diseases runs high among all the people, many of whom dwell on the lake in houses placed on piles.

MARAS or **MARASH,** a city of Asiatic Turkey, located near Mt. Taurus, about 90 mi. north of Aleppo in whose vilayet it was included when that city was part of the Ottoman empire. American missionary and Jesuit schools are located here, in addition to many mosques and Mohammedan schools. Hittite monuments found near Maras indicate that it was originally a Hittite town. The city fell to the Moslems before the year 700 and was the scene of conflict with the Byzantines. It did not become part of the Turkish empire until the 16th century. Maras is fairly prosperous, with an extensive trade in carpets and embroideries. Pop. 1927, 50,000.

MARAT, JEAN PAUL (1743-93), French revolutionist, was born at Boudry, Switzerland, on May 24, 1743. For some years he was an extremely successful doctor. While in England he had taken a keen interest in questions of government and several years before the Revolution had written one or two pamphlets of a revolutionary character. With the calling of the Estates General he turned exclusively to politics and soon became one of the most radical and bloodthirsty of the Jacobins. His paper, *L'ami du peuple* was ferocious in its animosity against the king, and the aristocrats, particularly Lafayette. Forced to hide in cells and sewers, he contracted a painful skin disease which later incapacitated him, his only relief being constant hot baths. While sitting in his bath he was assassinated by Charlotte Corday on July 13, 1793.

MARATHON, a running race, held mostly over open ground. The name derives from the celebrated run made between Marathon and Athens by the Olympic runner Pheidippides, in 490 B.C., who after running 22 miles, with his dying breath informed the Athenians of the Greek victory over the Persians. The word is now used for any long-distance athletic event, as in swimming, skating, skiing, or motorcycling; but the chief marathon is the running competition held every four years under the auspices of the international OLYMPIC GAMES. The distance for this race has been set at 26 miles, 385 yards, somewhat longer than the distance covered by the original Marathon runner.

In 1896, when the modern equivalent of the Olympic Games was first held, the marathon was fittingly won by Loues, a Greek peasant, whose time was 2 hr., 55 min., 20 sec. This time was soon broken in subsequent marathons over the same distance. A comparison is not always fair, however, since the character of one course may work hardships for runners who might make better time over more level country. Up to 1928 the United States twice won the Olympic Marathon; but the best time in this event was won by Finland in 1920, when Hannes Kolehmainen covered the course at Antwerp in 2 hr., 32 min., 35⅘ sec. The non-Olympic marathon has been run in considerably faster time. In 1930 Karl Koski, of the Finnish-American Athletic Club, won the national American Amateur Union marathon on Staten Island, N.Y., in 2 hr., 25 min., 21⅕ sec. Marathon running is the most exhausting track race. The best runners have been men over 30 years, with light, powerful bodies; and a strong heart to withstand the gruelling pace.

MARATHON, BATTLE OF, 490 B.C., a military engagement fought by the Athenians, numbering about 10,000, and the Plataeans with heavy arms aggregating 1,000, against the Persians, numbering, according to tradition, more than 100,000. To prevent the Persians from attacking Athens and to gain time until the Plataeans and Spartans could join forces with them, the Athenians under Miltiades marched toward Marathon, about 20 miles from Athens. The Greek center was weak; but the flanks were strong and secured by the hills. Realizing their opponents' strength, the Persians left their rear guard of about 20,000 behind, and embarked in an attempt to take Athens from the sea. Then the Greeks attacked, overwhelming the flanks and then the Persian center. Following this victory the Greeks quickly marched to Athens to prevent the Persian landing, in which they were also successful. Athenian losses amounted to 192 against the Persians' 6,400.

MARBLE, a term under which may be included three types of rocks, crystalline limestones or marbles proper, ONYX marbles, and SERPENTINE marbles. All are forms of CALCITE, the carbonate of calcium, or mixtures of this with other minerals, and are used as ornamental stone.

The crystalline limestones are DOLOMITES or LIMESTONES which have been metamorphosed by heat and pressure beneath the earth's surface. Consequently they have been recrystallized, and are usually massive and vary in texture from coarse to fine. In color they may vary widely, the purest being a fine, clear white, almost translucent. Impurities, such as carbonaceous matter, may color them gray to black, others conferring varying and often beautiful shades of pink, yellow, green, red and brown. These colors are usually distributed in streaks, veins and irregularly cloudy blotches throughout the stone. Marbles are used for ordinary structural work, for ornamental trimming on buildings, for monuments and statuary. Their value depends on the polish they can take, the ease of working them, and their beauty.

Onyx marbles are banded and translucent deposits of calcite, used for decorative work, derived from surface hot-spring and limestone cave deposit. Onyx marble is not true onyx, which is a form of silica. Serpentine marble is a mixture of green serpentine with calcite, which often shows beautiful green and

yellow coloring, sometimes with black and red.

Marbles are widely distributed. The Carrara marbles of Italy are famous. The Appalachian Mountain States also produce fine marbles. *See also* TUFA; STALAGMITE; PETROLOGY.

MARBLE FAUN, THE (also called *Transformation* or *The Romance of Monte Beni*), a somber romance set in Italy, by NATHANIEL HAWTHORNE; published 1860. A young Italian count, Donatello—half-human, half-faun—is in love with Miriam, an American artist, and one night, to save his sweetheart, murders the girl's mysterious tormenter, hurling the sinister follower from the Tarpeian Rock. Gradually Donatello's moral consciousness is awakened, until at last, in remorse, he goes to prison for his "crime." Two other important characters are Hilda and Kenyon, two young Americans whose wholesome romance ends happily. The book, so richly atmospheric, is virtually a complete guide to many parts of Rome.

MARBLEHEAD, a town in Essex Co., northeastern Massachusetts, situated on a rocky promontory on Massachusetts Bay, 16 mi. northeast of Boston. It is served by the Boston and Maine Railroad and by buses. The harbor is formed by an L-shaped arm, known as Marblehead Neck. There are a few farms and factories, but the town is principally a summer resort with facilities for bathing, fishing and yachting. There are many places of historic interest, including the old Lee Mansion, King Hooper Mansion, the home of Elbridge Gerry, St. Michael's Church and the Three Cods tavern. Marblehead was settled about 1629. The town became a port of entry in 1774. On Apr. 3, 1814, the frigate *Constitution* sought safety under the guns of Fort Sewall from a pursuing British fleet. In the waters near by the battle between the *Chesapeake* and the *Shannon* was fought June, 1813. Pop. 1920, 7,324; 1930, 8,668.

MARBURY VS. MADISON, a case which led to a notable decision of the United States Supreme Court: the first assertion of the Court's right to declare a statute of Congress void because at variance with the Constitution. William Marbury was one of several justices of the peace nominated by President Adams on Mar. 2, 1801, and confirmed by the Senate on Mar. 3, whose commissions had been withheld by President Jefferson, inaugurated Mar. 4. Marbury sued in the Supreme Court for a writ of mandamus to compel Secretary of State James Madison to deliver the commission, relying upon an act of Congress empowering the Court to issue such writs to compel executive officers to perform certain duties. Supreme Justice John Marshall, rendering decision in Feb. 1803, held that the clause of the Judiciary Act of 1789 upon which Marbury relied had undertaken to give the Court original jurisdiction as to objects not mentioned in the Constitution, which expressly lists the cases in which the Court shall have such jurisdiction, and was therefore null and void.

MARCASITE, a pale, brass-yellow mineral with the same composition as PYRITE, iron sulphide, but paler in color, and crystallizing in the ORTHORHOMBIC SYSTEM. Pyrite is formed from hot solutions whereas marcasite may be deposited from cold, near-surface solutions. Marcasite occurs in spear-shaped crystals, or coxcomb-like aggregates, and as globules in clay. It is not as common as pyrite, but its uses are the same. *See also* ORE DEPOSITS; CRYSTALLOGRAPHY.

MARCEL, ETIENNE (d. 1358), provost of the merchants of Paris 1354-58, and leader of the Third Estate in its attempt to establish constitutional government in France. The Estates General in 1355 voted supplies for an army of 30,000 for the war with England, on condition that the taxes should fall equally on all citizens, and that the Estates might assemble at will. This army was defeated at Poitiers, 1356, and King John carried prisoner to England, leaving the Government in the hands of the dauphin, Charles. The Estates then demanded further reforms, but were dismissed by the dauphin. In 1357 the Estates General set up a commission of 36 to administer the Government; taxes were to be collected and spent by nominees of the Estates. The dauphin was compelled to agree. This revolutionary Government succeeded no better than the monarchy. Marcel and his supporters enlisted the aid of Charles the Bad of Navarre. Excesses of the Paris mob provoked a royalist reaction. An army of nobles, assembled to put down the Jacquerie, attacked Paris. Charles of Navarre deserted his Parisian allies; they were ready to make peace with the dauphin, but he refused to negotiate with Marcel. The Paris populace then turned against Marcel, and he was murdered on the night of July 31, 1358, as he was inspecting the city's defenses. W. I. B.

MARCELLINUS, ST. (3rd century), Bishop of Rome, was born in Italy in the 3rd century. He served as Bishop of Rome from 296-304, when he was martyred during the Diocletian persecutions. He is said to have recanted temporarily in the torture chamber, but this is denied by St. Augustine. His life is chiefly involved in legend.

MARCELLINUS, ST. (fl. 5th century), a minister of the Emperor Honorius and a friend of St. Augustine. He was commissioned by the emperor to proceed against the Donatist faction in Africa, but was put to death on a false accusation of disloyalty to Honorius. He has been highly praised by St. Augustine and St. Jerome, and St. Augustine dedicated to him the famous *City of God.*

MARCELLUS, name of two popes. St. Marcellus I, 308-309, one of the first territorial organizers of the Church, was banished by Emperor Maxentius. Marcellus II became Pope Apr. 9, 1555, but died within a month. He had been president of the Council of Trent. His greatest work was the restoration of the Vatican library. Palestrina's "Missa Papae Marcelli" was composed after his death.

MARCH, FRANCIS ANDREW (1825-1911), American philologist, was born at Millbury, Mass., Oct. 25, 1825. In 1855 he taught at Lafayette College where he became professor of philology in 1857.

He was associate editor of the *Standard Dictionary* from 1890 to 1895 and for many years devoted himself to a study of the development of the English language. Among his writings were *Method of Philological Study of the English Language,* 1865, and *A Comparative Grammar of the Anglo-Saxon Language,* 1870. He died at Easton, Pa., Sept. 9, 1911.

MARCH, PEYTON CONWAY (1864-), American army officer, was born in Easton, Pa., Dec. 27, 1864, and educated at West Point and the Artillery School at Ft. Monroe. He directed an artillery corps in the Philippine insurrection in 1899-1902 and was commander of the A.E.F. artillery in France in the first year of American participation. In May, 1918, he was commissioned a general of the U.S. Army and became chief of staff. For distinguished services in the World War he was decorated by six European countries and awarded the Distinguished Service Medal.

MARCHAND, GILLES A. (1886-), Canadian educator, was born at Champlain, P.Q., May 11, 1886. He joined the Oblate of Mary Immaculate Order in 1906 and was ordained priest in 1912. In 1909-14 he studied at the Gregorian University, Rome, taking doctor's degrees in philosophy and theology. Called to the University of Ottawa in 1914 he served as professor of philosophy and later of theology, until 1923. He was rector successively of the Grand Seminary of Ottawa, the Sacred Heart Oblate College, and of the University of Ottawa.

MARCHESI, MATHILDE (1826-1913), German singer and teacher, was born at Frankfort-am-Main, Mar. 26, 1826. The loss of the family fortune induced her to become a musician. Her teacher, MANUEL GARCIA, when suffering from the results of an accident, gave over his students to his promising young pupil, which suggested her future career. She became a famous European concert singer, and devoted later years to teaching, at Paris and Vienna. Among her noted pupils were Di Murska, Gerster, Eames, and Melba. She died at London, Nov. 17, 1913.

MARCION, one of the most important Christian heretics of the 2nd century, was a wealthy shipowner born at Sinope in Pontus. He is said to have been the son of a bishop, although Tertullian calls him a convert from paganism. In 140, he went to Rome, but finding his views in conflict with those of the majority in the Church, he withdrew from it, and founded his own church. Nothing is known of his later life; he died after 160.

According to the system of Marcion, there were two gods, the god of Law and the god of Love. The god of the Law, that of the Old Testament, is a lesser deity whom Marcion terms the Demiurge. The god of Love, revealed in the Gospel of Luke and in the epistles of Paul, is the supreme god, the real father of Christ. Marcion's idea of two gods is derived from GNOSTICISM. Marcion also believed Paul to be the only true apostle, because he alone understood Christ. He believed faith to be the way to salvation; and held that since matter is evil, Christ's body could not have been material, hence his suffering was not real but merely apparent.

The movement begun by Marcion and carried on by his disciples grew in popularity, and soon Marcionite churches sprang up in both the East and the West. But due to suppressive measures, Marcionism began to decline toward the end of the 3rd century, and by the 7th century the movement had disappeared entirely.

MARCOMANNI, a Germanic tribe which established a powerful kingdom in Bohemia near the beginning of the Christian era. Tiberius found it necessary to make a treaty with their king Marbod in 6 A.D. Penetrating to the Danube, they turned back an attack by Domitian. In 167 they joined with the Quadi and Sarmatians to force their way across the Danube, raiding as far as Aquileia. Marcus Aurelius defeated them in 180. Sporadic raids by the Marcommani occurred subsequently, until they merged with other Germanic tribes and disappeared from history during the 4th century.

MARCONI, GUGLIELMO (1874-), Italian inventor, famous for his work on WIRELESS telegraphy, was born at Bologna, Apr. 25, 1874. In 1895 Marconi became convinced that the Maxwell-Hertz waves could be utilized to send signals without wires. His crude experiments near Bologna demonstrated the practicability of wireless communication and he went to England to continue his experiments and to secure financial support. He obtained his first wireless patent in June 1896. A year later a wireless communication company was organized at London, later known as the Marconi Wireless Telegraph Company, Ltd. The first trans-English Channel message was sent in 1898, the first transatlantic in 1901, the first England to Australia in 1918. In 1916 Marconi began investigations of the short waves later used for beam-sending and directional wireless. In addition to his discovery and exploitation of principles underlying wireless communication, Marconi invented a number of mechanical aids to the efficient transmission of messages, including detectors, generators and duplex sending and receiving sets. Besides the importance of wireless communication between land stations, Marconi's inventions also made possible the despatch of messages from land stations to ships, and for ships to communicate with each other at sea. Marconi's work in wireless communication also played an important part in the development of RADIO communication.

Scientific recognition of Marconi's part in solving certain technical problems of wireless telegraphy came to him in 1909 when with Ferdinand Braun he was awarded the Nobel Prize for physics, but the popular impression that the Italian inventor was the sole originator of wireless communication is a misconception. In the same year Marconi was appointed a senator by the King of Italy. In 1930 he was elected president of the Italian Royal Academy of Sciences, following his presentation of a radio station to Pope Pius XI, and was also awarded the John Scott medal.

MARCUS AURELIUS ANTONINUS (121-180 A.D.), Roman emperor 161-180. As an infant, on the death of his father Annius Verus, he was adopted by his uncle Titus Antoninus Pius, who in 138 succeeded Hadrian as emperor. He received an excellent training in rhetoric and philosophy, being especially attracted by the tenets and precepts of the Stoic school of thought. In 139 Marcus Aurelius received the title Caesar and in 146 married Faustina, the daughter of Antoninus Pius. From 161 to 169 Marcus Aurelius shared the administration of the empire with Lucius Verus, also the adopted son of Antoninus Pius. During this period a plague breaking out among the legions in the east spread throughout the empire with terrible effect. From the death of Verus in 169 until his own, Marcus Aurelius, by nature a man of peace, was obliged to devote himself to the defense of Rome's northern frontiers against barbarian attacks, his most inveterate foe being the Marcomanni, a powerful people inhabiting the region to the north of the Upper Danube. Fortunately a revolt against his authority in Syria came to an end with the assassination of its author, Avidius Cassius, in 175. Marcus Aurelius opposed the spread of Christianity inasmuch as the Christians by their refusal to participate in the worship of Roman gods and the ruling emperor, weakened the unity of the empire. His thoughts upon life and his own relation to it, his responsibilities and his aspirations, which in the course of his campaigns he gradually recorded in his *Meditations,* reflect the patience and generous spirit of Marcus Aurelius, and show the deep impress of Stoicism.



MARCUS AURELIUS

MARCY, WILLIAM LEARNED (1786-1857), American writer and public official, was born at Southbridge, Mass., Dec. 12, 1786. He graduated from Brown University in the class of 1808. He later studied law and was admitted to the New York bar. He won distinction in the War of 1812. Appointed Recorder of Troy in 1816, he was removed owing to his opposition to De Witt Clinton. He supported Van Buren's division of the Democratic Party, and was a member of the Albany Regency. In 1823 he became State Comptroller, and from 1829-31 was Justice of the New York Supreme Court. In 1831 he was elected to the United States Senate, where in defending Van Buren he stated that "to the victors belong the spoils." He was Governor of New York, 1833-39, Secretary of War during the Mexican War, Secretary of State under President Pierce, and author of many state papers. During his service as Secretary of State, many important affairs came under his jurisdiction, including the handling of the Ostend Manifesto, the policy of the United States towards Central American filibustering expeditions, and the troublesome question of enlistment of soldiers in the United States for the British Army in the Crimean War. Marcy died at Ballston Spa, N.Y., July 4, 1857.

MARCY, MOUNT, the highest summit in the Adirondacks, located in the northeastern part of New York State about 10 mi. south of Lake Placid, 30 mi. southwest of Lake Champlain and 45 mi. southwest of Plattsburgh. The mountain is dome shaped and extends above the timber line to an elevation of 5,344 ft. The vegetation on its summit consists of stunted heaths, dwarfed willows and other typically arctic-alpine plants. Lake Tear-of-the-Clouds, generally considered the chief source of the Hudson, lies just southwest of Mount Marcy at an altitude of 4,300 ft. A magnificent panoramic view of the entire Adirondack region can be obtained from the summit. The Indians called this peak Tahawas or Cloud-divider.

MAR DEL PLATA, a city of Argentina, situated about 250 mi. from Buenos Aires. It is the summer resort and vacation playground for the north central part of the republic, and is said to be one of the most beautiful cities in South America. It has a mild climate, modern hotels, and splendid bathing beaches. There are numerous golf courses, tennis courts, race tracks, and pleasure boats for fishing and other water sports. Est. pop. 1930, winter, 50,000; summer, 125,000.

MARDI GRAS, a day of festivity and parades, celebrated on Shrove Tuesday, the last day before the beginning of Lent. The name is derived from the French custom of leading a fat ox in the street parade, *Mardi* meaning Tuesday, and *gras,* fat. During the Middle Ages, the period extended from Jan. 6, the feast of the Epiphany, to Ash Wednesday. To-day many Italian cities, principally Rome and Venice, have gay and splendid pageants, floats with beautiful tableaux, and houses decked with flowers. Everyone may join in the merrymaking, wearing costumes and masks if they choose. The French and Germans, too, celebrate the day, though the latter's *Fastendienstag* is not to be compared with the spontaneity shown by the Latin peoples.

In the United States, the carnival idea was first thought of in Mobile, Ala., in 1831. New Orleans, now famous for its Mardi Gras celebrations, had its first street parade in 1837. Twenty years later, there appeared a secret, masked group, who called themselves the Mystick Krewe of Comus. Their float, representing the demon actors in Milton's *Paradise Lost,* was so striking that it set the tone for all the street pageants to follow. Other secret societies have been organized, made up of the leading business and professional men of the city who plan and finance the pageants. An annual feature of the occasion is the giving over of the rule of the city by the mayor to King Rex, who is escorted by an impressive court and many bodyguards. The parades of the day are fol-

lowed by lighted tableaux in the evening, balls and general hilarity, with much throwing of confetti and blowing of horns. Memphis, Tenn., is another city known for its Mardi Gras celebrations.

MARDIN, a city of Kurdistan in Turkey, built about 5000 ft. above sea level on the side of a cone-shaped hill topped by a ruined castle. Mardin is on the important caravan routes to Urfa, Aleppo and Aintab. There are numerous Christian monasteries and churches, baths, bazaars and mosques here. Barley, sesame and wheat are the chief items produced in the region, and the weaving of cotton and wool is the principal occupation. Pop. 1927, 31,077.

MARENGO, BATTLE OF, a decisive victory won by Napoleon over the Austrians under Gen. Melas on June 14, 1800, at the village of Marengo in northern Italy. By crossing the Alps by the Great St. Bernard pass with his entire army Napoleon penetrated the territory far in the rear of the enemy, forcing them to fight in defense of their communications. The battle raged all day. By noon the Austrians were victorious, but Napoleon fought stubbornly till the timely arrival of Desaix with reserves lent elan to the French counter-attack and saved the day. By routing the Austrians utterly Napoleon forced them to evacuate and concede to him most of northern Italy, including Piedmont, Genoa and Lombardy.

MARE'S-TAIL (*Hippuris vulgaris*), a perennial aquatic herb of the water-milfoil family. It grows in swamps and bogs in North America and also in Europe and Asia. The smooth slender stem grows about a foot high bearing narrow, sharp-pointed leaves crowded in numerous verticals, and very small greenish flowers borne in the leaf axils.

MARGARET, ST., martyr of Antioch in Asia Minor, whose life is surrounded by legend, is said to have embraced Christianity against the wishes of her father, a pagan priest. She consecrated herself to God and was martyred by a Roman prefect whose offer of marriage she had rejected. The feast of St. Margaret is kept on July 20.

MARGARET (1353-1412), Queen of Denmark, Norway, and Sweden, was born in 1353, the daughter of Valdemar IV of Denmark. After the death of Valdemar in 1375, Olaf, her infant son by Haakon VI of Norway, inherited the Danish Crown. The death of Haakon in 1380, and of Olaf in 1387, left Margaret sovereign of both Norway and Denmark. A revolt of Sweden against Albert of Mecklenburg, gave Margaret the Swedish crown also. She chose as her successor her cousin, Eric of Pomerania and united Scandinavia in the Union of Kalmar. Eric was crowned King of Sweden, Denmark, and Norway in 1397, but Margaret continued the real ruler of Scandinavia until her death Oct. 28, 1412.

MARGARET MARY ALACOQUE, ST., apostle of the devotion to the Sacred Heart of Jesus, was born at Lhautecour, France, July 22, 1647. She practiced intense mortifications of the body and is said to have received visions of Christ. She died at Paray-le-Monial, France, Oct. 17, 1690, and was blessed Sept. 18, 1864, by Pius IX. Her feast day is Oct. 17. In 1920 she was canonized.

MARGARET OF ANGOULÊME (1492-1549), Queen of Navarre, sometimes Marguerite, was born Apr. 11, 1492 at Angoulême, France. She was the daughter of Charles of Orléans and a sister of Francis I of France. In 1509 she married the Duc d'Alençon and after his death married in 1527 Henri d'Albret, titular King of Navarre. Henri died in 1544 and she assumed control of the government. Margaret maintained a brilliant court and is famous as a patroness of literature. Rabelais, C. Marot, J. Peletier, N. Denisot and many others gathered at her court and enjoyed her protection. Her chief literary work was the *Heptameron*. Margaret died at Odoten-Bigorre, France, Sept. 21, 1549.

MARGARET OF ANJOU (1430-82), Queen of England, the daughter of René of Anjou, was born on Mar. 23, 1430. She was married to Henry VI, king of England, at the age of 15, and soon became politically unpopular because of her French birth and sympathy for the policies of the Duke of Suffolk. Her unpopularity and her tendency to seek foreign aid contributed to the downfall of the house of Lancaster and the rise of the house of York. She spent most of her later years in exile, dependent upon the bounty of the French king, Louis XI. Margaret died in France on Apr. 25, 1482.

MARGARET OF CORTONA, ST. (1247-97), was born at Laviano in Tuscany about 1247. She was of great physical beauty and finally became a penitent of the Third Order of St. Francis. It was then that she began to receive those visions and revelations that have been made famous in the *Legend of St. Margaret,* written by her director and friend, Fra Giunta Bevegnati. The saint died at Cortona Feb. 22, 1297, and was canonized May 16, 1728.

MARGARET OF SCOTLAND, ST. (c. 1045-93), was born in Hungary or possibly in England about 1045. She became the wife of Malcolm of Scotland and was much beloved because of her charitable gifts to the Church. She died at Edinburgh, Nov. 16, 1093, and was canonized by Pope Innocent IV in 1250. Her feast is held on June 10.

MARGARINE, or butter substitute is made of animal fats or vegetable oils churned with milk. There are two types: (1) Oleomargarine, a combination of animal fats and vegetable oils with beef oleo oil predominating; (2) a strictly vegetable oil product in which cocoanut oil is usually the chief constituent. The latter is known as nut margarine, although the United States Federal law requires all margarines to be labeled oleomargarine, regardless of their ingredients. Margarine is used in place of Butter. It is wholesome, digestible, and has the same fuel value as butter. Its vitamin A content varies with the fats used, but is almost always much less than that of butter.

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MARGATE, a seaside resort and municipal borough on the Isle of Thanet, Kent, England, lying on the north coast of Thanet, 74 mi. southeast of London. In the middle of the 18th century a local Quaker, Benjamin Beale, invented the first bathing machine, and Margate, with its fine beach, has since been a popular bathing resort. To-day it has an 8 mi. promenade along the sea front, several charitable institutions and a public park. There is also the Church of St. John the Baptist (1050), which presents Norman, Perpendicular and Decorated styles. A jetty constructed in 1854 makes the town accessible to vessels in all tides. Fishermen and colliers still ply the adjacent waters. Pop. 1921, 46,480; 1931, 31,312.

MARGINAL UTILITY, the utility of the last added increment, or unit, of a stock of economic goods. Suppose that an individual starts out to buy shoes. One pair of shoes has for him a very high value; he would perhaps pay $12 for that pair; for a second pair he would pay less, only $10; and for a third pair he refuses to pay more than $5. In other words, the marginal utility of the first pair of shoes is $12, of the second pair $10, of the third pair $5, and so on down the scale. If the number of units increases, marginal utility decreases, and vice versa. This is called the LAW OF DIMINISHING UTILITY, based on the psychological fact that the more an individual has of a particular good, the less he values any one unit, assuming that his standards of taste have not changed in the meantime.

The units of the commodity, however, are qualitatively alike, that is, the pair of shoes for which the above individual would pay $12 is exactly the same as the pair for which, under different circumstances, he would only pay $5. The differences in marginal utility express not differences in the quality of the unit, but differences in the intensity or importance of the want which each unit satisfies.

The concept of marginal utility was introduced into economic theory simultaneously by W. I. JEVONS, the English economist, and a group of Austrians, Menger, Wieser, and Bohm-Bawerk, in the 19th century. They considered marginal utility the sole determinant of value, thus opposing the prevalent view that cost of production determined value. Modern economists following ALFRED MARSHALL, have accepted the theories both of cost and marginal utility. *See also* AUSTRIAN SCHOOL; DIMINISHING RETURNS. E. W. G.

MARGIN TRADING, the buying or selling of stocks on margin in which the speculator furnishes only a part of the money used and the broker supplies the balance. It is comparable to the buying of any commodity on credit. Let us assume that one desires to buy 100 shares of a stock that is selling at $150. At this price the cost would be $15,000 plus broker's commission. The customer puts up $5,000 as part payment and the broker obtains credit for his customer to the amount of $10,000. In return for the credit the broker holds the stock involved and the customer must pay interest on this amount. Meanwhile the customer is the holder of 100 shares of stock and entitled to dividends thereon. If the price advances to $180 he could sell his 100 shares for $18,000, pay off his loan of $10,000, carrying charges and broker's commission, recover his margin of $5,000 and make a profit of about $2,800.

MARGUERITE, a name sometimes applied to the daisy but more especially to various species of *Chrysanthemum* with daisy-like flowers. The marguerite or Paris daisy (*C. frutescens*), grown in gardens, is a small much-branched bush bearing well above the foliage numerous solitary heads of white or lemon-yellow flowers. Among other plants called by the name are the golden marguerite (*Anthemis tinctoria*) and the blue marguerite (*Felicia amelloides*).

MARIANNE ISLANDS. *See* LADRONE ISLANDS.

MARIÁNSKÍ LÁZNĚ. *See* MARIENBAD.

MARIA THERESA (1717-80), queen of Hungary and Bohemia, archduchess of Austria and empress of Germany by marriage, was born at Vienna, May 13, 1717, the eldest daughter of the Emperor Charles VI. In 1736 she was married to her cousin Francis, grand duke of Tuscany. Four years later her father, the emperor, died. Before his death he had secured the acceptance of the Pragmatic Sanction by which, since he had no male heirs, the Habsburg lands would go to his daughter. Almost immediately the French and Bavarians invaded Bohemia and Frederick the Great entered Silesia while Charles Albert laid claim to the imperial crown. The empress hastened to Pressburg, organized a Hungarian army, obtained the support of England, made peace secretly with Prussia, in which she gave up Silesia, and by land concessions to Spain, obtained the election of her husband, Francis, as emperor of Germany. The war is known in history as the War of the Austrian Succession. It ended in 1748 in the Peace of Aix-la-Chapelle in which Maria Theresa recognized the cession of Silesia.

But the energetic empress did not mean to lose Silesia for all time. She made treaties with France, Russia, Sweden and other powers for a war against Prussia. Before she could mobilize her forces, however, Frederick the Great, learning of the coalition against him, himself took the offensive in 1756, thus beginning the Seven Years' War on the Continent. During the protracted conflict, which also extended to America and India, Maria Theresa was unsuccessful in her efforts to regain Silesia. Despite the fact that Frederick was at times almost conquered, he always managed to recover, and in 1763 the war ended with the Peace of Paris, giving America and India to England, and the Peace of Hubertusburg, confirming Frederick's right to Silesia. Upon the death of her husband in 1765 she secured the election of her son Joseph as emperor and appointed him as a ruler in the Habsburg dominions. During most of her life-time, however, she kept the direction of affairs in her own hands. She increased the efficiency of the civil government, encouraged education and agriculture and did much to improve Vienna. In 1772 she again turned her attention to foreign affairs.

After protracted and difficult negotiations with Frederick the Great and Catherine II, Maria Theresa obtained Galicia and Ludomeria as her share in the first division of Poland. Three years later she secured Bukovina from Turkey.

One of the ablest women rulers of history, Maria Theresa had a shrewd knowledge of men and affairs. Courageous and ambitious she knew what was practical, and rarely let her ambitions get the better of her judgment. In domestic matters she was a faithful though stern mother to her large family of 16 children, 10 of whom survived her. Two of her sons became emperors of the Holy Roman Empire and one of her daughters, Marie Antoinette, became queen of France as the wife of Louis XVI. Maria Theresa died at Vienna, Nov. 29, 1780.

MARIBOR, Austrian *Marburg,* a city of the former province of Slovenia, YUGOSLAVIA, located on the Drave River, surrounded by level woodland. A 15th century castle, an episcopal palace and a cathedral also built in the Middle Ages are the notable buildings. A school for vintners, theological and teachers' schools are in Maribor. The city lies in a very fertile plain, and has an important trade in fruit, wine and timber. Boots and shoes, iron, tinware and liqueurs are manufactured, and oil-refining and flour-milling are carried on. Pop. 1931, 33,149.

MARICOPA, a North American Indian tribe living since early in the 19th century near the Pima, along the Gila River in southern Arizona, and speaking a dialect of the Yuman linguistic stock. They are said to have migrated to their present location from the Gulf of California. They are agriculturists, like the Pima whom they resemble in most phases of culture.

MARIE ANTOINETTE (1755-93), queen of France and archduchess of Austria, was born in Vienna on Nov. 2, 1755, the ninth child of Maria Theresa and the Emperor Francis. Her education was much neglected. In 1770 when only 15 years of age she became the wife of the Dauphin of France, who, four years later, ascended the throne as Louis XVI. At first the impression made by Marie Antoinette in her adopted country was good, her youth and beauty standing her in good stead with the French people. Unfortunately, the impression did not last long, and even before the French Revolution broke out Marie Antoinette was very unpopular. Her personal extravagance was a source of much criticism, her manners were indiscreet, and she intrigued in politics against the interests of France. She was the mother of four children, two of whom died before the outbreak of the Revolution. As the Revolution progressed, the popular feeling against her became more and more acute because of well-founded suspicions that she and the king were secretly negotiating with her brother the emperor. After the overthrow of the monarchy she was imprisoned and called upon to endure humiliation upon humiliation, all of which she bore with courage and dignity. Her final agony was her appearance, white-haired, and with her hands tied behind her, in the rough cart that bore her to the guillotine on Oct. 16, 1793.

MARIE FEODOROVNA (1847-1928), Princess Dagmar of Denmark, the daughter of King Christian IX, was born Nov. 26, 1847. She became the wife of Czar Alexander III of Russia and the mother of Nicholas II and of two other sons and two daughters. Her jealous nature led her to attempt to dominate her son Nicholas, and at the outbreak of the revolution she escaped from Russia and died in Denmark, Oct. 13, 1928.

MARIE GALANTE, an island of the French West Indies, located about 16 mi. southeast of Guadeloupe and 20 mi. north of Dominica. It has an area of about 57 sq. mi. and forms one of the dependencies of Guadeloupe. The almost round island has shores that are rocky and difficult of approach. On the southwest coast is Grand Bourg, the principal city. The shoulders of the plateau, which rises to a height of almost 700 ft. in the center of the island, are covered with trees. In the depressions cotton, coffee, sugar cane and cacao are grown. Marie Galante was discovered by Columbus in 1493 and colonized by the French in 1648. Pop., 1921, 22,608.

MARIE LOUISE (1791-1847), second wife of Napoleon, and Empress of France, was born in Vienna, Dec. 12, 1791, the daughter of Francis I of Austria. After NAPOLEON'S defeat of the Austrians at Wagram in 1809, and the treaty of Vienna, Austria entered into alliance with the Emperor, who divorced Josephine and married Marie Louise, April, 1810, then a young girl of nineteen. She bore him a son, the King of Rome, satisfying his craving for a direct heir. After Napoleon's overthrow she was appointed by the allies as ruler over Parma, Piacenza and Guastella. In 1821 she married her chamberlain, Count Neiperg. She died in Vienna, Dec., 1847.

MARIENBAD (Czech *Mariánští Lázně*), a Czechoslovak city and famous spa in Bohemia, situated about 30 mi. from Plzeň in a pleasant valley surrounded by wooded hills. It has Catholic, Protestant, Russian and Anglican churches and a synagogue, all modern; a theater, town hall, casino, bathhouses, colonnades and two hospitals. The springs are the property of the Tepl Abbey. Visitors annually average 37,000. The inhabitants are mostly Germans. Pop. 1930, 17,547.

MARIE OF FRANCE (late 12th century), French poet and fabulist, was born either in the Île de France or in Normandy but lived chiefly in England. A king mentioned in her fables has been identified by some authorities as Henry II, placing her poems in the early 13th century, though language and other internal evidence indicate rather the late 12th century. The works of Marie de France include the narrative poems known as *Lais,* a collection of animal fables called *Ysopet,* and a poem of 2,300 lines on St. Patrick's purgatory.

MARIETTA, a city in northwestern Georgia, county seat of Cobb Co., situated 20 mi. northwest of Atlanta. The Louisville and Nashville and the

Nashville, Chattanooga and St. Louis railroads afford transportation. Marietta is an attractive resort in winter and summer, as well as a manufacturing center producing chiefly cotton products. Kennesaw Mountain, two mi. from the city, marks the scene of a notable Confederate victory, in which 2,500 Federal troops fell. Gen. Sherman, after a terrific flank attack, forced the Confederates to retreat south from Marietta, toward Atlanta, in 1864. The city has a national cemetery, in which more than 10,000 Federal soldiers are buried. Marietta was founded in 1840 and chartered in 1852. Pop. 1920, 6,190; 1930, 7,638.

MARIETTA, a historic city of eastern Ohio and county seat of Washington Co., on the Ohio River at the mouth of the Muskingum River, 60 mi. southeast of Wheeling, W.Va. Its transportation facilities include the Baltimore and Ohio and the Pennsylvania railroads, buses and the Marietta municipal airport. The city's manufactures, specializing in oil-well apparatus on account of Marietta's location in one of the pioneer oil fields of the country, were valued approximately at $6,000,000 in 1929. In the same year the retail trade amounted to $10,177,257. Marietta Forest Nursery, maintained by the state, lies 6 mi. from the city. Marietta College, chartered in 1835, had its origin in Muskingum Academy, founded in 1797. Charles G. Dawes is an alumnus and was born here.

Ft. Harmar was erected at the mouth of the Muskingum in 1785. In 1788, Marietta, the first permanent settlement of the Northwest Territory and the oldest in Ohio, was founded by Gen. Rufus Putnam and a band of 48 veterans of the Revolution and



COURTESY CHAMBER OF COMMERCE, MARIETTA, O.

"PICKETED POST," AT THE CONFLUENCE OF THE OHIO AND MUSKINGUM RIVERS, FIRST SETTLEMENT BY THE 48 PIONEERS

named in honor of Queen Marie Antoinette. The original land office of the Ohio Company and also a section of "Campus Martius" blockhouse, built in 1796, where Gen. Putnam lived, are landmarks of Marietta. The "Conus" mound, prehistoric earthwork of the mound builders, is located in Mound Cemetery. Marietta was incorporated in 1800, and chartered as a city in 1852. Pop. 1920, 15,140; 1930, 14,285.

MARIETTA COLLEGE, Marietta, O., a coeducational institution established in 1835, was begun as Muskingum Academy in 1797, nine years after the original settlers arrived at Marietta. The productive funds in 1931 totaled $1,284,512. The library of 98,000 volumes includes the Stimson Collection on History of the Northwest Territory. In 1931-32 there were 354 students, and a faculty of 35, directed by Pres. Edward Smith Parsons.

MARIGNANO, BATTLE OF. The accession of FRANCIS I as King of France in 1515 meant that a policy of power, prodigality and dynastic expansion would replace the more cautious one of his predecessor LOUIS XII. The first step was naturally directed at regaining power in Italy, and the youth and inexperience of the new Habsburg sovereign of the Netherlands, CHARLES V, augured well for the success of Francis's enterprise. Opposing him were the Imperialists, under the Holy Roman Emperor Maximilian, the troops of Pope Leo X, the Spanish infantry of the King of Aragon, and the soldiers of the Duke of Milan. These together guarded the likely passes across the Alps which the French might take. Francis did the obvious and therefore brilliant thing of taking his cavalry and infantry through two unguarded passes which were thought to be impracticable. He thus surprised the papal troops, and flanked the enemy, who started to retreat. Francis carried the pursuit to Marignano where on Sept. 13, 1515 a bloody battle was fought until complete darkness had succeeded both the sunset and the moonlight. The arrival of Francis's Venetian allies forced the retirement of the Swiss mercenaries fighting for the Imperialists. The Battle of Marignano was of especial importance to Francis I in that it conferred prestige upon him and secured French popular enthusiasm at the outset of his reign for pursuing the war in Italy. J. BA.

MARIGOLD, the name given to various plants of the composite family with showy usually yellow flowers. The pot marigold (*Calendula officinalis*), an annual herb native to southern Europe, is very commonly planted in gardens. Various species of *Tagetes,* popular as ornamentals, are called marigold, as the so-called African marigold (*T. erecta*), with orange or yellow flowerheads 2 to 4 in. broad, and the French marigold (*T. patula*), bearing smaller flowerheads with yellow rays tinged with red. The Cape marigolds are cultivated species of *Dimorphotheca* with handsome white, purple, yellow or orange flowers. *See also* POT MARIGOLD.

MARIN, JOHN (1870-), American painter and etcher, was born in Rutherford, N.J., in 1870. He studied in Philadelphia, New York and Paris. He belongs to the Post-Impressionist movement, and stands high as a colorist. For his water color paintings he is especially noted. His *Mills of Meaux* is owned by the French Government, *Falling Leaves* is in the San Francisco Art Museum. Other paintings hang in the Metropolitan Museum, New York, the Brooklyn Museum and the Phillips Memorial Gallery, Washington.

MARINE CORPS, in the United States, a body of men enlisted for service either on shore or on vessels afloat. In nearly all maritime countries, claiming to be war powers, they constitute a separate mili-

tary body, trained to fight either as infantrymen or artillerists, and especially trained to be used in naval engagements or in expeditionary and advanced base work.

In 1931 the number of marines authorized by law was 27,400; appropriated for, 18,000. The commissioned officers allowed were 4% of the enlisted men, and there were authorized, therefore, 1,094; and appropriated for, 1,030. In addition, there were 152 warrant officers allowed and appropriated for. Marines are organized, clothed and equipped very much as soldiers of the land forces and they have about the same preliminary instruction. Therefore, they are qualified for duty with either the Army or the Navy and are of double value to the nation, as often shown.

Their headquarters, barracks, schools and depots are on shore; and from these details are drawn as required for ships' complements or any other duties to which they are assigned.

The senior officer of the Marine Corps is the Major General Commandant, who receives requisite orders from the Secretary of the Navy as to its direction. The headquarters of the corps is in the Navy Building, Washington, D.C. The commandant, so located, has as an assistant a brigadier general in the Marine Corps, and he and three other brigadier generals are the heads of administrative staff departments, paymaster, quartermaster and adjutant and inspector, respectively.

The headquarters, Department of the Pacific, Marine Corps, is located at San Francisco, Cal., and has a major general in command who handles matters in Hawaii and the Far East, as well as matters on the west coast of the United States.

There are two recruiting centers of the corps, the east coast one being located at Parris Island, S.C., and the west coast one at San Diego, Cal. Men enlisted in the eastern part of the United States receive their preliminary training at the former, and those entering from the western part get their introductory training at the latter.

The mission of the marines called for in Navy war plans is to supply to the Navy highly trained land auxiliaries embracing infantry, light and heavy artillery, machine guns, gas and flame troops, land signal troops and aviators (land planes).

As part of their complement, some 30 of the battleships and larger vessels carry detachments of marines of various sizes as part of their permanently assigned ship's company. Besides sentinel duty, these men are assigned to the secondary battery of the ships, manning them as whole crews, and also are a part of the landing force of each ship, ready for immediate duty on shore if required. In time of peace, marines, in connection with bluejackets, protect life and property of United States citizens abroad in case of impending danger. It is noted that marines may be landed on foreign soil without a declaration of war, and without indicating that a state of hostilities exists between the two countries.

Under the law, if a national emergency exists, such marines as may be spared by the Navy may be ordered to serve with the Army, to reinforce its strength and to supply additional troops where needed. In the World War, particularly, this came to pass, where the Fourth Marine Brigade serving as part of the Second Division of the A.E.F., helped to stop the last attempt on Paris at Belleau Wood, and also participated in many major operations of the World War in 1918.

Marine expeditionary forces have been on duty in Haiti, Nicaragua and China. Marine guards are maintained at certain American Legations, Managua, Nicaragua, and Peiping, China. Strong forces are maintained at Pearl Harbor, Hawaii, and at the Philippine Islands and Guam, in the Pacific, and Guantanamo Bay, Cuba, Porto Rico, and Colon, Canal Zone, on the Atlantic. The Garde D'Haiti is commanded by an officer of the Marine Corps, its junior officers being qualified Haitians and its enlisted men Haitian. Until partially withdrawn, the same condition existed in the Nicaraguan National Guard.

Marines have successfully guarded United States Mails in transit. In aviation, the marines had a strength of 104 officers and 1,100 enlisted men, and a total of 89 planes in 1931.

The corps was organized by the Act of the Continental Congress, Nov. 10, 1775, antedating the Declaration of Independence, and the organization of the regular navy. Marines have participated with credit in every campaign fought from 1776, when they helped storm the British forts at New Providence, down to Belleau Wood. Marine officers are recruited from the Naval Academy graduates, from the ranks of the corps itself and from civil life. A limited number of members of the enlisted force and of the Marine Corps Reserves enter the Naval Academy preparatory class each year by virtue of selection for ability. Their motto is "Semper Fidelis" and their emblem is the globe, eagle and anchor, worn as a distinguishing device on the cap or collar or emblazoned in the standards of the corps. R. E. C.

MARINE ENGINEERING, a term which in general applies to the machinery which propels a vessel. Although boilers, steam and Diesel engines, and turbines are designed on the same principles for both land and water use, yet those for successful marine use must be especially built for this field.

Marine steam boilers for example, installed in such vessels as the *Bremen* and *Europa* of the North German Lloyd, and *President Coolidge* of the Dollar Line, consist of a number of small units compared to those in a modern superpower station on shore. Furthermore some stations operate on superheated steam at pressures of 1,800 lbs. which is much higher than on the fastest Atlantic liners or the latest scout cruisers. However, superheated steam has been used for many years in cargo and passenger vessels, and the degree of superheat as well as the steam pressure is constantly advancing.

Then again there is a difference in the types of boilers. Broadly speaking there are two types, water tube and fire tube, the latter being represented by

the well-known cylindrical Scotch boiler. Water and fire tube boilers may be either coal or oil fired—oil being largely used.

As to propulsion units, viz., steam and Diesel engines, turbines either direct drive or by gears, and electric drives—the important difference between land and marine practice, is that marine units must be reversible, whereas land are not. For instance, when a vessel is entering a harbor, to avoid collision with another vessel, it is often required to immediately reverse the engine from full speed ahead to full speed astern. Such sudden changes, not necessary for land units, cause great strain on the moving parts as piston and connecting rods, and crank shaft of engines, and on the shafting of turbines, and various other parts, which have to be designed and built to safely withstand sudden changes in speed, and direction of rotation.

Auxiliaries for the boilers and engines as pumps, fans, feedwater heaters and condensers as well as valves and fittings, must be designed to withstand the pitching and rolling of a vessel, and built of materials that are not affected by salt water nor will start galvanic action. C. H. Hu.

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MARINE INSURANCE, a term applied to the insurance of ships and their cargoes against damage or destruction during a voyage. Insurance may also be obtained to cover liabilities, such as the damages resulting to another ship in a collision and the losses suffered by shippers when goods are intentionally destroyed as a measure of safety during an emergency. Shipowners may insure their expected profits for a voyage and may even obtain insurance on ships which are overdue and perhaps lost but at higher premiums. Marine insurance is handled by brokers who obtain the best available markets for their clients and secure the most favorable terms. The insurance may be only for one voyage or it may be for a period of time. It is customary to insure the hulls of sailing vessels only for a single voyage; policies on steamships are usually renewed annually. Policies may be either open or valued, in the case of the former indemnity for total losses is set according to the actual value of the loss, while with the latter the indemnity is based on the value stated in the policy. Marine insurance was the original type of insurance. Systems of quasi-insurance were in use to cover maritime risks even in ancient Roman times.

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MARINE LIFE, all forms of life in seas and oceans. It is generally considered not to include those forms of life which are in any way dependent upon dry land. Hence no birds, insects or amphibians are properly classified as marine life. Furthermore marine plant life is restricted to but comparatively few forms. The principal types of marine animals are the fishes and the crustacea, which may well be compared to the mammals and insects on land regarding their variety. Among the marine plants algae and diatoms are the most prominent. The chief factors determining life in the oceans are the temperature, salinity and pressure. The temperature is principally a surface phenomenon and ranges from below 32° F. in the salty Arctic ice water to some 80° F. in the Red Sea, dependent upon the latitude. It is more or less uniform at great depths. The pressure is related exclusively to depth.

According to their habitat the marine forms of life are classified into three groups: the *Benthic,* or stationary, and rooted, fixed to, or crawling over the ocean floor; *Nekton,* the swimming and moving creatures, and finally the *Plankton,* those merely drifting without any means of propelling themselves, completely at the mercy of wind and waves. The typical shore, or littoral animals are benthic: molluscs, barnacles, star fish, jelly fishes and coral. The fishes are exclusively nekton, and most abundant in the superficial layers, though absent at no depths. The plankton group (*see* PLANKTON) consists partly of small, and largely of microscopic objects.

MARINERS, NOTICES TO, instructions for the correction of sailing directions, light lists, charts, changes in topography, changes in soundings, changes in buoys, light ships and the like. They are published weekly by the HYDROGRAPHIC OFFICE under the authority of the Secretary of the Navy. Copies can be obtained by mariners, free of charge, by applying to the Hydrographic Office, to one of the branch hydrographic offices or to any of the agencies in seaboard or lake ports. They are also on file in the U.S. Consulates, where facilities are afforded for their inspection. Shipmasters have been especially requested to inform the Hydrographic Office immediately of any newly discovered danger in navigation or of the establishment or change of any aid to navigation.

MARINE TERMINALS. *See* SHIPPING TERMINALS.

MARINETTE, a lake port city in northeastern Wisconsin, the county seat of Marinette Co., situated on Green Bay of Lake Michigan, at the mouth of the Menominee River, 180 mi. north of Milwaukee. Bus lines, lake steamers, ferries and four railroads afford transportation. There is an airport. Grain, potatoes and hay are the chief crops of the vicinity. The principal local manufactures are lumber, paper, gloves and knitted goods. In 1929 the total factory output was approximately $10,000,000; the retail trade amounted to $7,369,204. The countryside is very beautiful, with splendid fishing grounds. Marinette was founded by the French about 1830, and was named for a queen of the Menominee Indians; in 1887 the city was incorporated. Pop. 1920, 13,610; 1930,

MARINUS and **MARTIN,** names of five popes. St. Martin I, 649-655, held the first Lateran Council to combat Monothelitism. He was taken to Constantinople by Emperor Constans II, condemned and banished to Cherson. Marinus I (Martin II), was Pope, 882-884. Marinus II (Martin III), 942-946,

was overshadowed by the notorious Patricius Alberic II. Martin IV, 1281-85, previously chancellor of Louis XI, was elected through force imposed on the cardinals by Charles of Anjou, who procured the tiara for him. Martin V, 1417-31, was unable to keep his promise to reform the Church, although he established his authority in the Papal State and promoted building in Rome.

MARION, FRANCIS (1732-95), American soldier, was born near Georgetown, S.C., in 1732. At the beginning of the Revolution he devoted himself to raising troops in South Carolina, and became a captain in Colonel Moultrie's regiment in 1775. For some time he was stationed at Ft. Moultrie, and in 1780 was commissioned brigadier-general of state troops. Although his soldiers were poorly equipped, they defeated the British at Nelson's Ferry, recapturing many of the prisoners taken at Camden, and were an effective hindrance to Cornwallis by intercepting communications and capturing British scouts. As a band of guerillas Marion's Brigade became famous for its daring and success against the British. In its sudden attacks and in its personnel and good marksmanship it was similar to John Morgan's Raiders of the Civil War. Using swamp paths to elude the enemy, the band, with Marion always the leader in daring and skill, on several occasions united with the army under Greene against Cornwallis. They were not disbanded until after the British evacuation in 1782. From 1782 to 1790 Marion served in the South Carolina senate, and from 1790 to 1795 as commander of Ft. Johnson. Marion died at Pond Bluff, S.C., on Feb. 27, 1795.

MARION, a city in southern Illinois, county seat of Williamson Co., situated 100 mi. southeast of St. Louis. It is served by three railroads and has an airport. Marion is a shipping point for fruit, truck crops, grain and live stock raised in this region. The city has lumber mills, creosoting plants, creameries and other industrial establishments. There are extensive coal-fields in the district. About 10 mi. southwest is Giant City State Park a formation of bluffs and chasms having the appearance of high buildings and narrow streets. Marion was settled in 1842 and incorporated in 1896. Pop. 1920 9,582; 1930, 9,033.

MARION, a city in north central Indiana, the county seat of Grant Co., situated on the Mississinewa River, about 60 mi. northeast of Indianapolis. It has adequate transportation facilities by rail, air and State highways. Marion trades considerably in grain and fruit. Oil and natural gas are found near by. The local manufactures include radios and radio cases. In 1929 the factory output amounted approximately to $35,000,000; the retail business reached a total of $14,021,307. The city is the seat of Marion College, established in 1889, and of a National Soldiers Home, and was the birthplace of Thomas Marshall, the statesman. Mississinewa Battleground and a Miami Indian reservation are in the vicinity. Marion was founded in 1825; chartered as a city in 1889. Pop. 1920, 23,747; 1930, 24,496.

MARION, a city of north central Ohio and county seat of Marion Co., located near the Scioto River, 45 mi. north of Columbus, O. It is on the Harding Highway, and its transportation facilities include the Big Four, the Chesapeake and Ohio, the Pennsylvania and the Erie railroads, the latter maintaining division shops here; a municipal airport lies 3 mi. west of the city. Marion is situated in an agricultural region producing corn and live stock, and manufactures road-building and agricultural machinery extensively. The city also has three steam shovel factories, steel works, and there are quarries of lime and building stone. In 1929 the approximate value of manufactures was $30,000,000; the retail trade amounted to $17,429,623. Pres. Warren G. Harding became editor and proprietor of the *Marion Star* in 1884. In 1920 he conducted his famous "front-porch campaign" for the presidency at his home in Marion. The Harding Memorial marks his burial place. Plotted in 1821, the city received its charter in 1890. Pop. 1920, 27,891; 1930, 31,084.

MARION, a town in northeastern South Carolina, the county seat of Marion Co. It is situated 25 mi. east of Florence; served by the Atlantic Coast Line and the Raleigh and Charleston railroads. Marion lies in a cotton and tobacco growing region. The town has lumber, cotton and cottonseed-oil mills and fertilizer works. Pop. 1920, 3,892; 1930, 4,921.

MARIONETTES, jointed puppets moved usually by strings which are attached to two pieces of wood, known as the "controller." Puppets of this type are operated from a scaffolding erected above the stage. Marionettes of other types are moved from below the stage by means of rods attached to the legs of the figures; or are slipped upon the hand of the performer, as in the traditional PUNCH AND JUDY show. The word "marionette" is probably derived from the images of the Virgin, or "little Marys," carried in Italian religious processions.

The art of the marionette is ancient. There is evidence that articulated puppets were known to ancient India, Egypt, China, Greece and Rome. Scholars disagree about the birthplace of the art, but the ancestry of the modern marionette may be traced back to Italy where, during the Middle Ages, the wooden actors flourished and whence they spread, carried by traveling showmen to fairs and markets throughout Europe.

During the 15th and 16th centuries, the popular character comedy of the legitimate stage, relic of the ancient Atellanes, took on a new lease of life in Italy and manifested itself in double form. The Improvised Comedy, known as the *commedia dell' arte,* consisted of scenes unwritten save in skeleton, and played by living professional actors who improvised their own lines; and, distinct from this growth, the Masked Comedy developed, the action of which was carried out by typical figures wearing masks and speaking in local dialects, but without improvisation. *See also* MASK.

From the *commedia dell' arte* and the Masked



1, 2, 3, 5, 6, COURTESY TONY SARG; 4, AMERICAN MUSEUM OF NATURAL HISTORY

THE FASCINATING ART OF THE PUPPET THEATER

1. Tony Sarg demonstrating the manipulation of a puppet. **2.** Tony Sarg and the puppets in *Christopher Columbus.* **3.** A complicated puppet which smokes and opens and closes its eyes. **4.** A marionette from Java. **5.** A scene back stage during a marionette performance, showing the complex method of control. **6.** Minstrel puppets.

Comedy the traditional characters—Pulcinella, Harlequin, Brighella and the lot—were transferred to the puppet-show, borrowing costume, type and rôles from the living actors for the enrichment of the marionette stage.

In the course of time, Pulcinella, wholly relegated to the puppet-stage, was carried by traveling showmen from Italy to the whole of medieval Europe, his crude horse-play being as successful in France, Germany and England as in his native Italy. Become cosmopolitan, he proceeded to take to himself a variety of names. In England he became Punchinello, shortened presently to Punch; in France, he was known as Polichinelle; in Germany, Kasperle; in Turkey, Karaguez, or Black Eye.

"Early in the Eighteenth Century," says Madge Anderson in her *Heroes of the Puppet Stage,* "antiquarians excavating near Herculaneum found a little statue of an actor with a nose just like Pulcinella's, and a nutcracker chin like his, and two humps and a fat stomach. It is supposed to be a portrait of Maccus, one of the Roman mimes. Maccus was one of the Attelan players, a company of actors who came from their native town of Atella and went about giving their comic plays on high wooden trestles. Atella was in the neighborhood of Herculaneum and Pompeii, where Maccus' portraits were found, and not far from Naples, the headquarters of Pulcinella. Maccus spoke the Oscan dialect, the language of the neighborhood where Pulcinella learned his dialect, and he may have been the great-great-grandfather of Mister Punch.

"This ancient jester was witty and insolent. He could not endure to be contradicted and his chief argument was a cudgel; first he knocked his opponents down and then he reasoned with them. He loved to imitate the cries of birds, especially the cackle of a hen, with his pivetta. This was a little whistle that the Atellan players used when they caricatured the metallic sound of the tragic actors' voices speaking through their great masks. The Punch and Judy showman still cries Punch's Root-to-too-it through a mouthpiece like the whistle Maccus used in Rome."

An old Neapolitan legend ascribes still another source for Punch. It says that, in vintage time, a company of strolling players came to Acerra, near Naples, when the country folk were celebrating the grape harvest, and were so taken with the comical appearance and rustic wit of one of the grape-gatherers, the village hump-back, a fellow with a huge nose, whose name was Puccio d'Aniello, that they persuaded him to join their company.

This Puccio d'Aniello became a great favorite, for nobody could keep from laughing at his antics; and when he died, another actor put on a false nose and a hump on his back, and also took the name, Puccio d'Aniello—a name which in time became slurred by soft Italian voices into "Pulcinella."

What one may do, others may follow, and soon there were a host of chicken-breasted, hump-backed clowns in the Italian cities, all cracking jokes and polls interchangeably, all playing the buffoon to a delighted populace and all bearing the name Pulcinella. So popular was this character that a host of marionette Pulcinellas soon took possession of the puppet-stage.

This seems a probable explanation of the birth of Punch, although there are those who cling to the idea that the name, "Pulcinella," since it means "little chicken," was given to the character because of his crowing-cry, his beak-nose and chicken-breast.

Although Punch appeared during his early days as fellow-actor on the puppet-stage with Harlequin, Brighella, Pantaloon and other characters of the ancient comedy, in the course of time an epic, which excluded his associates, grew up in England about his own personality. He acquired a wife and child and a dog Toby—and fell afoul of the Law and the Devil. Only Scaramouche, of all his ancient comrades, continued to figure in the lurid tale of his misdeeds.

Gradually this epic crystallized; and, wherever the showman set up his booth, the children of Merrie



ENGLISH PUPPET THEATER
From a 14th century manuscript

England, both young and old, gathered at the shrill note of Punch's trumpet, on street-corners or at the fairs, to rejoice in the Tragical Comedy of Punch and Judy, a puppet drama of pure wickedness, which in modified form but still magnificently untinged by promptings of conscience or remorse, has survived the passing of the centuries and is to be seen to-day.

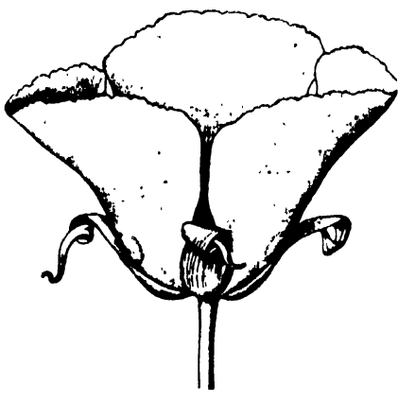
The popularity enjoyed by the marionettes during the middle centuries was not limited to the common people. The dolls performed before kings and nobles, many of whom maintained puppet-stages and troops of players for their own entertainment. The rôles played by the puppets reflected the spirit of the times and ranged from religious drama and morality plays to daring burlesques and political satire, varied by fables and episodes from the tales of chivalry, as well as the broad buffooneries of the improvised comedy. In England the long quarrel between the Puritans and the playwrights resulted in 1642 in the closing of all the theaters except the marionette playhouses—presenting an opportunity which the puppet-showmen were quick to seize with the whole repertory of the stage at their disposal. In Germany, the marionettes alone upheld the torch of drama through the dark period of the Thirty Years' War.

Many famous persons have written plays for marionettes, among them George Sand, Goethe, Maurice Maeterlinck and Arthur Schnitzler, while *The Toy Symphony* and *The Children's Fair* of Haydn were composed expressly for puppets. The 20th century has seen a revival of the art of the marionette in Europe and America, due chiefly to the interest of Gordon Craig in Florence; Herr Schmidt and his pupil, Paul Brann, in Munich; and Tony Sarg and Remo Bufano in New York—together with a host of others in both hemispheres. Among the Italians the *Orlando Furioso* of Ariosto is still perhaps the favorite among the traditional puppet-plays. T. SA.

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MARIOTTE, EDMÉ (c. 1620-1684), French physicist, was born in Burgundy about 1620. Most of his life was spent near Dijon as prior at St. Martin-sous-Beaune. He was one of the founder members of the French Academy of Science established in 1666. He is best known for having independently discovered Robert Boyle's law, known in France as Mariotte's law, the relation between gas volume and pressure. His *Essais de physique* were published in 1676-79. He died in Paris, May 12, 1684.

MARIPOSA LILY, a genus (*Calochortus*) of small cormous plants of the lily family with strikingly beautiful flowers, known also as butterfly lily and globe-tulip, several of which are planted for ornament. There are upwards of 40 species native to western North America, some 20 occurring in California. The coated corms give rise to slender stems bearing narrow leaves and somewhat tulip-like flowers of a wide range of colors and often with conspicuous spots and other markings near the center. Among those grown in gardens are the yellow mariposa lily (*C. luteus*) and the white mariposa lily (*C. venustus*), both natives of California. Utah has selected the Nuttall's mariposa lily (*C. Nuttallii*), better known as the SEGO LILY, as the state flower.



FROM JEPSON, MAN. FL PLANTS CALIF., COPYRIGHT

WHITE MARIPOSA LILY

MARIPOSAN or **YOKUTS,** a North American Indian linguistic stock comprising some forty tribes or village groups, each dialectically distinct from the others. This group occupied the San Joaquin Valley in California, their lands extending from the lower Sierra Nevada to the Coast Range and from Mts. Pinos and Tehachapi to the Fresno and Chowchilla rivers. A northern group, the Cholovone, lived along the San Joaquin River between the Tuolumne and the Calaveras rivers. The Yokuts or Mariposan resemble the Southern Californian Yuman tribes in physical appearance. They lived in communal tule-covered houses, and used also the earth-covered sweatlodge. They were excellent makers of coiled baskets, made crude pottery, the only pottery of central California, and were indifferent woodworkers, their implements and utensils being very crude. They were a peaceable people, with a simple social organization. Important ceremonies were held for the initiation of young men and at death and for mourning.



FROM JEPSON, MAN. FL. PLANTS CALIF., COPYRIGHT

GOLDEN MARIPOSA LILY OR GOLDEN LANTERN

Calochortus pulchellus

MARIST BROTHERS, or Marist School Brothers, a Catholic educational society under the official title, Institute of the Little Brothers of Mary. Founded in 1817 at Lavalla, France, by Venerable Benedict Marcellin Champagnat, who also composed its rules and constitutions, the Institute received papal approbation in 1863. Priests are excluded from membership. Besides conducting primary and secondary schools, the Brothers interest themselves in every aspect of youthful endeavor in industrial schools, working-boys' homes, orphanages, and summer camps. They also labor in the foreign mission field. A total of 24 provinces and 3 districts comprises 575 schools and 8,562 members, including novices.

MARITIME ALPS. *See* ALPS.

MARITIME PROVINCES, the name applied to the provinces of Nova Scotia, New Brunswick and Prince Edward Island and the colony of Newfoundland. The three provinces form part of the Dominion of Canada, but Newfoundland has not joined the Confederation.

MARITZA, the largest river of Bulgaria, rising in the Rilo Mountains and flowing southeast through a fertile region of Eastern Rumelia. PHILIPPOPOLIS, now Plovdiv, the second largest city of Bulgaria, is on the banks of the Maritza. The river continues in its southeasterly direction until it reaches Adrianople, where it is joined by its main tributaries, the Tunja and the Arda. Here the Maritza turns sharply to the south and for 100 mi. to its mouth at Enos on the northeastern corner of the Aegean, marks the boundary between Turkey and Greece. The entire length of the Maritza is about 300 mi., but only the 100 mi. from its mouth to Adrianople are navigable.

MARIUPOL, a port city in the southeastern part of the Ukraine S.S.R., on the Kalmius River near the Sea of Azov. It is a shipping point for coal, grain, iron and oil products. Fishing, the manufacture of knit goods, and smelting are foremost industries. Greek colonists from the CRIMEA founded the city in the 18th century. There were 21 changes of government during the revolutionary period of 1917-20. Mariupol's heterogeneous population includes Ukrainians, Russians, Greeks, Germans, Jews, Poles and Bulgarians. Pop. 1926, 71,211.

MARIUS, GAIUS (155-86 B.C.), Roman general. After three years' service in the war against Jugurtha under the command of Quintus Caecilius Metellus 106-103 B.C., Marius, undaunted by his humble origin, returned to Rome to sue for the consulship. Successful in his candidacy he superseded Metellus in Africa. He soon won a complete victory, and with the help of his subordinate SULLA, captured Jugurtha. Two great hordes of barbarians, the Cimbri and Teutones, migrating southwards threatened Italy, and Marius, the man of the hour, elected consul in successive years, defeated the invaders 102-101 B.C., and was hailed as Rome's deliverer. Less successful in the ensuing years as a politician, he regained some of his old prestige by successes in the Social War 90 B.C. However, when war broke out 88 B.C. with Mithradates, the senate appointed Sulla to the chief command. After Sulla's departure from Rome, Marius by irregular means had the command transferred to himself, whereupon Sulla, who had not yet left Italy, returned rapidly and defeated Marius who fled from the city. Later, when Sulla was fully occupied with the Mithradatic war, Marius suddenly reappeared at Rome, and instituting a reign of terror, secured his seventh consulship, only to die a few weeks later. Marius as well as being a great general created Rome's first standing army of professional soldiers.

MARIVAUX, PIERRE CARLET DE CHAMBLAIN DE (1688-1763), French novelist and dramatist, was born at Paris, Feb. 4, 1688. Beginning in his youth he wrote plays and novels, chief among them *Marianne,* 1731-41, which is sometimes said to be the original of Richardson's *Pamela.* In all of his works he developed his own special vein of philosophic humor now called *marivaudage.* He was a prolific dramatist, writing nearly 40 plays. He died at Paris, Feb. 12, 1763.

MARJORAM, the name given to several aromatic plants of the mint family, the leaves and young shoots of which are used as a condiment. The wild marjoram (*Origanum vulgare*), a native of the Mediterranean region and grown for ornament, is naturalized in eastern North America. The closely allied sweet marjoram (*Majorana hortensis*), native also to Europe, is likewise cultivated.

MARK, the German monetary unit, equivalent at par to 23.8 cents. The present mark is the REICHSMARK, issued as one of the German economic reconstruction measures in 1924. The pre-war mark collapsed in 1923 following a decline effected by previous currency inflation and the unsound economic condition of the country.

MARK, ST., the author of the GOSPEL OF ST. MARK, quite possibly of Hellenic origin, although the traditions represent him as a Levite. If the Mark that is referred to in several Books of the New Testament is the same as the author of the second Gospel, a fact that has been questioned, there are a few additional facts about a writer who would otherwise be completely unknown. According to these Mark accompanied St. Paul as a fellow worker on various expeditions and was apparently a young man at about 50 A.D. Mark then served as an assistant in minor capacities to ST. BARNABAS, ST. PAUL and ST. PETER and was an evangelist of importance until his death. The earliest traditions assign the scene of his final activities to Alexandria.

MARK, GOSPEL OF ST., the second Gospel of the New Testament, has been traditionally assigned to "John whose surname was Mark," mentioned in the ACTS OF THE APOSTLES. It is the most original of the three synoptic Gospels, and is regarded as reflecting the influence of Peter. The ancient statement of Papias, quoted by Eusebius, that Mark was "the interpreter of Peter," harmonizes with the accounts we possess of Mark and Peter elsewhere in the New Testament. That it was probably written for Gentile



THE LION OF ST. MARK, THE SYMBOL IN ART OF THAT SAINT
From an engraving by Martin Schongauer

Christians is the conclusion drawn from the presence of Latin forms not found in the other Gospels, the omission of all reference to the Jewish Law, and the

explanations of Jewish customs. The last 12 verses of the Gospel are now regarded by many scholars as an early appendix from some other source, "canonical but not authentic."

The most striking characteristic of this Gospel is its graphic detail written as if by an eye-witness. It is not an orderly history but a sequence of independent stories, relating the miracles, parables and sayings of Jesus in Galilee and Judah. The Sermon on the Mount is not included, and much of the teaching of Jesus found in the other Gospels is omitted here; but the circumstances amid which the teaching is given are minutely described, so much so that Mark's narratives are vivid when describing the crowding of the "multitudes" about Jesus, as he passed in and out among them, teaching and healing all who sought him. As regards the date of this Gospel scholars are now almost unanimous in fixing it between 63 and 70 A.D., and there is no valid reason for questioning the tradition that it was written at Rome.

MARKET, in economic and business usage a term including several concepts. ALFRED MARSHALL approaching it from the economic standpoint quotes with approval Cournot's definition "not any particular market place in which things are bought and sold but the whole of any region in which buyers and sellers are in such free intercourse with one another that the prices of the same goods tend to equality easily and quickly" and again W. S. JEVONS "any body of persons who are in intimate business relations and carry on extensive transactions in any commodity." Fred E. Clark describes it as "a center about which the forces leading to exchange of title operate," while H. R. Seager thus defines it "a place or conjunction of means of communication through which buyers and sellers are brought together for the exchange of economic goods." This term, therefore, as was pointed out by Maynard, Weidler and Beckman, has three concepts sometimes used singly, sometimes in combination; a geographical point or area wherein transfers of ownership of goods or services are effected, a body or organization of buyers and sellers or a group of forces which determine price and facilitate exchanges.

In business parlance a market is a group of people to whom, or a geographical area to the inhabitants of which, a seller may reasonably hope to vend his goods. Here the element of uniformity of price is relatively unimportant as a common device for expanding the market is that of price reduction within certain areas or to certain groups of possible purchasers. Nor is the idea of free intercourse or means of communication so important as the business man is prepared to furnish his own means of communication or intercourse to reach isolated areas or groups provided he is convinced of the possibility of making sales.

During the Middle Ages weekly markets were important distributive agents. These were areas within certain towns in which producers and merchants gathered on designated days of the week to vend their wares. They were often general in character although many specialized in certain articles, as the corn market, the coal market and the sugar market in London.

This usage is still preserved in the fruit and vegetable markets of certain cities, the organized produce exchanges such as the grain exchanges, and the STOCK EXCHANGE. In these localized markets trading is usually regulated by elaborate and detailed rules but the more scattered markets are often characterized by a comparative absence of regulation either private or governmental. R. S. A.

Medieval Markets and Fairs. Many cities in the Roman Empire possessed regularly established markets. Seasonal fairs (*emporia*) also existed in a number of cities, especially in the east. With the decline and dissolution of the Empire in the west this form of commerce tended gradually to be replaced by a rural economy, where barter and peddling prevailed. During the early Middle Ages markets and fairs once more came into being. Originally a royal prerogative, the right of market became a feudal right controlled by the local lord, who might be a bishop, abbot or layman. With the growth of towns markets became more numerous. Local merchants could buy or sell freely; outsiders paid a toll for the privilege. Such markets were held weekly or biweekly, were restricted to a single building or district in the town, and dealt largely in goods of local origin. Buying and selling elsewhere than in a duly authorized market was forbidden.

During the 12th century trade expanded far beyond the capacities of the local markets, and fairs became increasingly important. They were normally under the control of some great feudal lord, were seasonal rather than weekly, and served a wider public than did the markets. Merchants were attracted by promises of safe-conduct and reduction of tolls, and frequently were granted special courts. Throughout the duration of the fair, which usually lasted from one to six weeks or even longer, these foreign merchants competed with the local merchants, but were restricted to stated hours. The greatest fairs, such as those of Champagne, assumed an international character, merchants coming thither from distant countries. Booths were set up by the local authorities and rented to visiting merchants. A week was allowed them to unpack and arrange their goods. Then came a specified number of days devoted to the sale of cloth only; next a like period for the sale of furs and hides. Another period was restricted to such goods as were sold by weight and measure. Finally came a few days of grace for the closing of accounts, payment of tolls, validating of contracts, etc. Among the goods sold at fairs were textiles of all sorts, especially woolen cloth, furs, cattle, fish, spices, drugs, salt, wax, vegetables, fruit, cereals, cheese, utensils, cutlery, jewels, incense and parchment. There was no universal system of weights and measures, each locality having its own. Money changers functioned as banks. Increasing fiscal demands by the French Crown and the use of a sea route from the Medi-

terranean to the northern ports contributed to the decline of the Champagne fairs. W. I. B.

MARKET INDEX, generally an index or estimate of the relative total purchasing power of different territories. Specifically an appraisal of the relative sales possibilities of different territories for the goods of a particular company. It often takes the form of estimates of the relative amounts of the products of the company likely to be sold in the various districts in which it sells. Some factors commonly used in computing market indexes are population of each district, incomes of residents, number of persons able to buy and number of persons likely to be willing to buy.

MARKETING, all activities which have to do with effecting transfers in the ownership of goods and with their physical distribution. It comprises all the services and efforts participating in the distribution of merchandise from producer to consumer save only those involving changes in form. From the economist's point of view these activities form a part of production since they result in the creation of time and place utility, but from the standpoint of the business man they constitute the work of distribution.

To a very considerable degree the characteristic features and problems of the present marketing system grew out of certain dominating forces in the INDUSTRIAL REVOLUTION; the tendency toward specialization in industry, the trend toward localization of industrial establishments, the persistent forcing of improvements in the technique of physical production and the development of mass production. Specialized production and localization conferred new importance on the processes of exchange and made the market place the most significant theater of economic action. These forces also resulted in the separation of producer and consumer in point of both time and distance with the resulting need of middlemen and go-betweens to bridge the gap between them and in the problems engendered by the production of goods for sale rather than for use. All these factors, but more particularly improved production technique and massed production, resulted in a tremendous increase in the total volume of goods produced and in the average volume manufactured under one management. As an outcome of them also the average business concern must manufacture in relatively large quantities in order to enjoy low costs of production. But low production costs do not result in PROFITS unless the goods turned out are sold. This increased output has resulted therefore in manufacturers engaging in extensive selling activities with the resultant armies of salesmen and floods of advertising matter which are so characteristic of our modern business life.

The systematic study of marketing developed relatively late. Statistics covering the subject are incomplete and often unreliable—being many times merely unofficial estimates or compilations of estimates. This situation was somewhat improved by the Census of 1930 which for the first time included statistics on distribution. The study of marketing, however, is extremely difficult to reduce to a statistical or scientific basis because it deals so largely with intangibles, matters of taste, whims, prejudices and the psychological reactions of groups of people. In this respect it differs from production which has to do with tangible things which can be weighed and counted and with motions which can be timed and measured.

Discussions of marketing commonly include the methods, agents and processes involved in assembling or dividing goods into the proper units for sale, the agents and methods employed in effecting the sale of goods including the creation of demand, transportation, storage, standardization and grading, the financing of marketing and the assumption of risks of style and price changes. *See also* COOPERATIVE MARKETING. R. S. A.

MARKHAM, CHARLES EDWIN (1852-), American poet, was born at Oregon City, Ore., Apr. 23, 1852. He spent his boyhood on a ranch in central California, and was educated at San José Normal School and two western colleges. His best known poem, *The Man With the Hoe,* appeared in 1898 and was reprinted all over the country. Soon after Markham went to New York, and thenceforth devoted himself to a literary career. Included in his publications are *The Man With the Hoe and Other Poems,* 1899, *Lincoln and Other Poems, Shoes of Happiness, Gates of Paradise, California the Wonderful* and the *Ballad of the Gallows Bird,* 1926. Markham has also written various prose works and has edited *The Book of Poetry,* 1927.

MARKHAM, SIR CLEMENTS ROBERT (1830-1916), British geographer, was born at Stillingfleet, Yorkshire, July 20, 1830. In 1850 he was a member of a relief party to search for Sir John FRANKLIN, in the Arctic. From 1852 to 1854 and again from 1860 to 1861 he traveled in South America, visited the East Indies and in 1867 accompanied Lord Napier to Abyssinia. Knighted in 1896, he was president of the Royal Geographical Society for 12 years, and was active in financing Captain SCOTT's Antarctic expedition of 1901. Markham was one of the foremost British geographers of his day and published books as *Peru, War between Chile and Peru,* and also wrote many articles for the Royal Geographical Society's Journal. He died at London, Jan. 30, 1916.

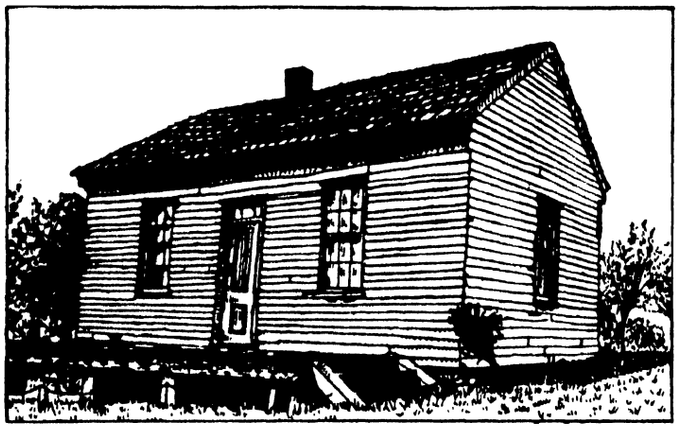
MARKHOR, a wild goat (*Capra falconeri*) of the high central Himalayas and Afghanistan. Its jet-black horns sweep backward and outward, twisting as they grow, until in old rams they show one or even two complete turns, and attain a length of 4 or 5 ft. Under the neck hangs a mane of yellowish hair a foot long. It is thought by some zoologists that the long-haired Angora breed of domestic goats found in Syria is derived from the markhor.

MARKING NUT, the fruit of a large tree (*Semecarpus Anacardium*) of the cashew family, native to the East Indies. It is a black heart-shaped nut, borne on a swollen receptacle. From the shell is obtained a blackish, resinous, acrid juice used as

a marking ink for cotton goods. When roasted to remove acridity, the nut is utilized for food.

MARKSMANSHIP, the ability to use firearms accurately. Its military application is generally restricted to the firing of SMALL ARMS. All combatant troops of the United States Army are required to receive a course in marksmanship prescribed for the weapon with which they are armed. Instruction begins with preparatory work without ammunition and ends with record firing on the range. The score made in record firing determines a firer's qualification.

MARK TWAIN (1835-1910), pen name of Samuel Langhorne Clemens, great American humorist and author. He was born in Florida, Mo., Nov. 30,



FROM MILLER STUDIO PHOTO, MOBERLY, MO.

BIRTHPLACE OF MARK TWAIN, FLORIDA, MISSOURI

1835, of a family gifted with wit, ingenuity and intelligence, but with very little else. His father moved the family to Hannibal, Mo., when Samuel was four, and died there a few years later. The young Mark Twain had little formal education, but coming of literate stock, educated himself and earned a living from the time he reached his teens. He was for years assistant to his older brother Orion, who edited and published the Hannibal *Journal,* learning typesetting and printing as an apprentice. With this trade at his command he set out as a journeyman printer, wandering about the country as far as Philadelphia and New York City. In his 20's he became a pilot on the Mississippi, and for four years, until the Civil War put an end to shipping on the Mississippi, he remained at that work. His pseudonym, "Mark Twain," was a pilot's cry, to mark a river sounding. Then with his brother Orion, who had been appointed Lieutenant Governor of Nevada, he saw the post-gold rush days of mining in Carson City.

He had written now and then for the newspapers he had worked on, but with the appearance of *The Celebrated Jumping Frog of Calaveras County* he became suddenly famous. In 1867 he went on a tour of the Mediterranean as a representative of the San Francisco *Alta California,* and the letters he contributed, which appeared in 1869 as *The Innocents Abroad,* were met by a storm of approval. No one since Dickens had roused such wide-spread and contagious enthusiasm. In him America had a great and original genius, and his popularity has never waned. By some miracle his distrust of European culture and aristocracy aroused very little rancor abroad, undoubtedly because, although with an idiom and a viewpoint peculiarly that of a democratic American, he was of the great line of satirists. Throughout his life he preserved a blazing hatred for hypocrisy, and more than once turned from the suaver attack by ridicule and exaggeration to blast outright the shifts and cruelties that he abhorred; most spectacularly, perhaps, in *The Mysterious Stranger.* His scorn for the conventional acceptance of ideas, for sentimental acquiescence in any form, was the inexhaustible source from which his work flowed. His great original genius saved him from the pitfalls of parody, so that his books are read with pleasure, and chiefly as pure humor, by those who are uninterested in or un-



MARK TWAIN'S CAMP ON JACKASS HILL, NEAR ANGELS CAMP IN CALAVERAS CO., CALIFORNIA

informed about the ideas and institutions which were the targets of his wrath. *Roughing It,* 1872, tells the truth about the life of the mining-camps as Mark Twain had seen them in Nevada, and can be read with deep interest by those who have never met the sentimentalized frontiersman of early Western fiction. TOM SAWYER, 1875, and its sequel HUCKLEBERRY FINN, 1884, stand squarely on their own feet, undoubtedly the best books for boys ever written. Like *Innocents Abroad, A Tramp Abroad,* 1880, the fruit of a second journey through Europe, riddles the culture-worship prevalent in Mark Twain's day. *Life on the Mississippi,* 1883, the second great documentary book, is the record of his life as a pilot, and, with *Roughing It,* will probably eventually be judged Mark Twain's most important contribution to American literature. THE PRINCE AND THE PAUPER, 1882, embodies all the native democrat's hatred of monarchy. *A Connecticut Yankee in King Arthur's Court,* 1889, which showed much the same fundamental motive, came as close to a parody (of the *Morte D'Arthur*) as Twain ever permitted himself.

For a while Twain's partnership in the publishing venture of Charles L. Webster seemed to promise a future free of all financial care. But the firm failed disastrously, and he returned to the treadmill of lecturing and writing against time. Of the books which followed each other in rapid succession, including *The American Claimant, The Tragedy of Pudd'nhead Wilson, Following the Equator,* his own favorite was *The Personal Recollections of Joan of Arc.* As his later life was overwhelmed again and again by trag-

edy, his sardonic note deepened, and *What Is Man?* privately issued in 1906, is a raging indictment of fate. Nevertheless, the easy judgment that Mark Twain was embittered in his old age is probably an injustice, and the better opinion now holds that *The Man Who Corrupted Hadleyburg,* 1900, *The Double-Barrelled Detective Story,* 1902, *Adams's Diary,* 1904, and even *Christian Science,* 1907, flowed from the same source as the earlier books. There has been perhaps no American genius who approached him, and we shall be fortunate if we have another of his rank in the history of our literature.

In appearance Mark Twain was striking, tall, erect, with a leonine head of white hair, and he permitted himself any eccentricities in dress that pleased him. In later life he retired to Redding, Conn., and built his house, "Stormfields"; and there he died, Apr. 21, 1910. *See also* AMERICAN LITERATURE.

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MARK-UP, the difference between the cost of an article to the distributor or seller—generally a retail store—and the price he asks from the customer to whom he sells. Retail mark-up is ordinarily determined by the seller who fixes the selling price according to his opinion and judgment. A science of pricing which will scientifically determine mark-up should develop when it becomes more widely understood that certain price levels must be met to make possible mass selling of products to consumers in quantities sufficient to provide constant employment to workers and full utilization of productive resources. E. A. F.

MARL, a loose, earthy or friable rock composed of a mixture of CALCITE or DOLOMITE and CLAY, in variable proportions. Commonly the color is gray, but LIMONITE may make it yellow, organic matter blue or black, and other substances color it green or red. Marl grades into shaly LIMESTONE on one hand, and calcareous clay on the other. Shell marl is made up largely of shell fragments and clay, greensand marl contains grains of GLAUCONITE. On exposure to air the marls crumble quickly into coarse soils. The principal use of this rock is in the manufacture of Portland cement and for sweetening sour soils. It is of extremely common occurrence.

MARLBOROUGH, JOHN CHURCHILL, DUKE OF (1650-1722), British general and statesman, was born near Axminster June 24, 1650. He started his career as page to the Duke of York, afterwards King James II, of whom his sister, Arabella, was mistress. Churchill himself became the favorite of Barbara Palmer, Duchess of Cleveland and mistress of Charles II, who gave him £5,000 and promoted his interests. After service in Tangiers in 1670 where he distinguished himself under Turenne, Churchill received lucrative appointments. Thriftily conserving his resources, he married Sarah Jennings in 1678. She was a brilliant girl whose ascendency over the Princess Anne, afterwards Queen, was absolute. In 1782 Churchill was created a Scottish, and in 1685, an English baron. On the accession of James II, he helped to crush the rebellion of the Duke of Monmouth. But in 1688, he deserted his royal master, joined William of Orange and on the latter's gaining the crown was created Earl of Marlborough. In 1689 he served in the Netherlands, and next year in Ireland but despite his ability, he was mistrusted. He had kept in touch with the exiled James, and in 1692 he was sent to the Tower on a charge of treason, but released. The chief blot on his fame was his betrayal to James and to the French, of a prospective attack by the British on Brest in 1694. With the accession of Anne in 1702 Marlborough became Captain-general of the English forces in the War of the Spanish Succession, winning the Battles of Blenheim, 1704, Ramillies, 1706, Oudenard, 1708, and Malplaquet, 1709, victories which revealed him as a strategist of high rank. Uncrowned sovereign of the realm, he was created Duke, and a palace called Blenheim was built for him near Oxford by Parliament. He was greatly enriched by the war, which he helped prolong, and when the influence of the Duchess over Anne had been undermined by Mrs. Masham, Marlborough was brought to book for embezzling public money and dismissed. At the accession of George I in 1714, the King restored Marlborough's honors but the honors were now empty of power, the Duke's day was over. He died June 16, 1722 and was buried in Westminster Abbey. Later his body was removed to Blenheim.

MARLBOROUGH, a city of Middlesex Co., eastern Massachusetts, 27 mi. west of Boston. It is served by the New York, New Haven & Hartford and the Boston & Maine railroads. The principal manufactures are boots and shoes and foundry and machine shop products. Marlborough was founded about the middle of the 17th century and was almost totally destroyed by the Indians in 1676. It was incorporated as a city in 1890. Pop. 1920, 15,028; 1930, 15,587.

MARLBOROUGH HOUSE, a large, red brick mansion between The Mall and Pall Mall, London, built by Christopher Wren in 1710 for John Churchill, 1st Duke of Marlborough. The house, which was celebrated for the lavish entertainments held there, was purchased by the government, 1817, and has been the town residence of Prince Leopold of Saxe-Coburg, Dowager Queen Adelaide, Prince of Wales, later Edward VII, Prince of Wales, afterwards George V, and the Queen Mother Alexandra (d. 1925). It was refitted in 1928-30 for the Prince of Wales. Marlborough House Chapel, built probably by Charles I, was originally connected with ST. JAMES'S PALACE.

MARLIN, a city in east central Texas, a noted health resort and watering place, the county seat of Falls Co. It is situated near Brazos River, 125 mi. south of Dallas; the city is served by bus and truck lines and two railroads. The city lies in a region producing oil, cotton, grain and milk; cottonseed milling and oil refining are the principal local industries, but

considerable profits are gained from the tourists who visit the hot radioactive mineral springs, discovered in 1890. Marlin was founded in 1850 and incorporated in 1867. Pop. 1920, 4,310; 1930, 5,338.

MARLOWE, CHRISTOPHER (1564-93), Elizabethan dramatist, was born in the cathedral town of Canterbury about Feb. 26, 1564, the son of a shoemaker. He entered Cambridge at the age of 17, became a pronounced skeptic, returned to London and went on the stage. At the age of 23 he produced the drama *Tamburlaine the Great,* 1587, an epic which may be said to have inaugurated the reign of blank verse in English literature. *Doctor Faustus,* c. 1588, dramatic predecessor to Goethe's masterpiece, contains such lines as the oft-quoted ones on Helen of Troy:

"Was this the face that launch'd a thousand ships,
And burnt the topless towers of Ilium?"

The Jew of Malta, c. 1589, a drama destined to be superseded by Shakespeare's *Merchant of Venice,* and *Edward II,* c. 1592, considered Marlowe's dramatic masterpiece, conclude the list of completed dramas. No list would be complete, however, without mention of the lyric, "Come live with me and be my love," in the pastoral poem, *Passionate Shepherd* and also the matchless fragment *Hero and Leander,* 1593. Marlowe, a contemporary of Shakespeare, was killed June 1, 1593, in a brawl at Debtford.

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MARLOWE, JULIA (1870-), American actress, was born at Caldbeck, Cumberland, England, Aug. 17, 1870. She came to America at the age of five and made her first appearance on the stage at Vincennes, Ind., in 1882, in *H.M.S. Pinafore.* As Parthenia in *Ingomar* at the Bijou Theatre, New York, in 1887, she appeared at a special matinee performance. She gave notable performances of Juliet, Viola and Rosalind, also adding to her repute by performances in *Colinette, Bonnie Prince Charlie* and *Barbara Frietchie.* In 1904 she joined E. H. SOTHERN, their association in romantic and Shakespearian plays lasting, with intervals, until 1924 when she retired from the stage. They were married Aug. 17, 1911.

MARMALADE PLUM, the delicious fruit of a Central American tree (*Achras Zapota*) of the sapodilla family extensively cultivated in warm countries. The tree grows 50 or 60 ft. high with a stout trunk and branches bearing smooth, oblong leaves a foot or more in length, white flowers in small clusters and a large brownish fruit, sometimes 6 in. long, with a thick skin enclosing firm, reddish flesh and a single seed.

MARMORA, SEA OF, a body of water between Europe and Asia, connected with the Black Sea by the BOSPORUS and with the Aegean by the DARDANELLES. It is about 160 mi. long, has a maximum breadth of nearly 50 mi. and an area of 4,500 sq. mi. The sea's greatest depth is 4,400 ft. The picturesque Princes' Islands are near the Asiatic shore in the northwestern part. The largest island in it is Marmora, from which the sea derives its name.

MARMOSET, a small Brazilian monkey of the genus *Callithrix.* They are clothed in soft fur, varying much in color and pattern; look like kittens, and behave like tiny squirrels, seeking their food, both vegetable and animal (insects), in the tree-tops. Manes, whiskers and often moustaches, resembling tufts of cotton, adorn their pretty heads. Marmosets are caught by the Indians in traps, or as babies. They are favorite but exceedingly delicate pets, and unable to survive long outside of the tropics.

MARMOT, any large burrowing rodent of the genus *Marmota,* mostly inhabitants of the mountains and high plains. The American woodchuck (*M. Monax*) and its relative, the whistler of the Rocky Mountains, the Alpine marmot of Europe, bobac of Siberia, and the red marmot of the Himalayas are characteristic examples. They make burrows in companies, or nest among loose rocks, and hibernate in winter. All are diurnal, feed mainly on grass, leaves of plants, roots, bark and seeds obtained in short journeys, and carried home for consumption. At the least alarm, they hasten under ground. The flesh of marmots is good, and in some countries forms an important element in the food of the natives; the skins also are utilized. E. I.

MARNE, a river of northeastern France. Rising on the Langres Plateau, it flows northwest and west for 325 mi. to its confluence with the Seine just above Paris. From its source it follows a meandering direction, first across a broad valley, past Chaumont, St. Dizier, from which point it is navigable, and Chalons; it then enters rolling country, coursing past Epernay and Meaux. The large volume of water coming in from the Petit Morin, Grand Morin, Ourcq, Saulx and other tributaries gives it a rapid current which supplies power for industrial plants. Canals connect the Marne with the Saone, Rhine and Aisne rivers and add to its commercial value.

MARNE, FIRST BATTLE OF THE, Sept. 6-9, 1914, a general engagement at the opening of the WORLD WAR in which the French, under Joffre, and the British, under Sir John French, checked the great German offensive into France. The German plan of campaign called for an advance through Belgium, in order to avoid the fortified escarpments that defend France on the east, and around the west of Paris, in order to envelop the whole French army against the Jura. Though success depended on a maximum strength for the marching flank, this flank was weakened, after operations had begun, by the transfer of four divisions to the Russian front and the uncontemplated diversion of seven first line divisions for the investment of Antwerp, Givet and Maubeuge. As a result, it was found at a late moment that the marching flank, under Von Kluck, could not pass to the west of Paris without weakening the German line.

Believing that the British, who had formed the flank of the Allied line, and all forces further west were so shattered as to be negligible, Von Kluck turned to the east of Paris, in the tracks of the British, with the idea of enveloping the flank of the French

line in that direction. In doing so he unknowingly but carelessly exposed his own flank to the army of Manoury, which had been formed on the west of the British and withdrawn into Paris. The opportunity for turning the German flank was first recognized by Gallieni, military governor of Paris, at whose insistence Joffre ordered a general attack for Sept. 6, in combination with a turning movement by Manoury north of the Marne. Manoury's attack of the German right rear, Sept. 5, together with the apparent withdrawal of the British, caused Von Kluck to move his whole army back across the river, Sept. 6-7, thus opening a wide gap between his own forces and the army of Bülow, next in line, into which the returning British, followed on the right by d'Esperey, were able to press and cross the Marne near Chateau-Thierry, Sept. 8-9. On the 9th, though Manoury was thrown back with the aid of fresh troops, the German attack in the center and east was everywhere repulsed, while the advance of the British and d'Esperey threatened to cut off Von Kluck's army and turn Bülow's flank. In order to restore the continuity of their line, therefore, the Germans commenced a retreat to the Aisne, where the gap was filled with fresh troops and the Allied advance stopped. While there was much heroism and competent leadership of individual armies the Battle of the Marne is a monument to German error rather than to the foresight of the Allies. The importance of the Allied victory can hardly be overestimated. It put an end to the belief in the invincibility of the Germans and it effectively blocked the execution of the German plan of campaign and their effort at the elimination of France early in the war.

D. D. I.

MARNE, SECOND BATTLE OF THE, the decisive battle in the WORLD WAR, began on July 18, 1918, and continued without interruption until Aug. 3 when the Allies occupied Soissons. All during the winter of 1917-18 the German command continued to bring its troops and guns from Russia, where victory had been won, to the west front for a final drive against the Allies in France. Month after month, Ludendorff, the strategist of the German offensive, continued to amass his troops till he had a superiority both in men and rifles. By May he had concentrated over 40 divisions along the heights of the Aisne for the supreme effort. On the 26th day of May the great offensive was begun. First at one salient, then at another, the German forces drove on with apparently irresistible force to a depth of 18 miles into the Allied territory. For two and a half months the attacks continued till the enemy was again on the Marne. Despite desperate resistance, they had pushed a salient south and west to Château-Thierry only 42 miles from Paris. Eastward they occupied the line of the Marne to Epernay; thence it bent sharply northward around Reims, which like Verdun continued to withstand the pressure of the German drive.

But the Château-Thierry salient was too narrow; not only was it open to flank attack, but it was extremely difficult to support a further advance on the front of so narrow and deep a sector. Realizing this, the Germans, after spending several weeks in consolidating their position and concentrating their forces, tried to correct the situation by widening the salient. To do this, they had to capture or isolate Reims on the northeast, cross the Marne to occupy the heights to the south, and in the northwest push westward along the line of the Ourcq and the Aisne.

The first task was to strengthen the line, preparatory to the effort to widen the Château-Thierry salient. To insure the success of this strategic movement every available reserve was brought up. The Allied line had to be broken at all cost, a wedge driven between the British and French and the way opened for the last stretch of the drive on the Allied nerve center at Paris. The FIRST BATTLE OF THE MARNE, which had been fought and lost in Sept. 1914, was to be fought again, and this time, so Ludendorff announced, with every assurance of German success.

East of Reims, powerful offensives were directed towards the French lines with Châlons-sur-Marne as the objective, while an even more powerful push was made west of the city towards Epernay. The success of these two moves would mean the isolation or capture of Reims, and the protection of the left flank of the German advance beyond the line of the Marne from Epernay to Château-Thierry. At dawn of July 15, following Bastille Day, the enemy attacked with great vigor east and west of Reims and along the Marne only to be repulsed at all points except on the 22-mile front on the Marne between Epernay and Château-Thierry. There they pushed forward to the heights to the south of the river. Quite unexpectedly, however, American troops which had already given an excellent account of themselves at Belleau Wood and Château-Thierry in June, completely checked the right wing of the German drive at Château-Thierry, the apex of the salient toward Paris. As a result further advance by the enemy southward became dangerous, if not impossible. The salient could not be widened, and the entire advance came to a halt.

At this moment, Foch, the generalissimo of the Allied armies, decided the time had arrived for a counter-offensive against the front and flanks of the German position. For weeks all available troops and supplies had been assembled behind the lines fronting the German salient on the west, preparatory to a supreme effort against the over-extended position of the enemy. Large bodies of troops and supplies were concentrated in the Villers Cotterêts area for the attack on the west side of the salient from Soissons to Château-Thierry.

On July 18 the great counter-offensive, which was to end the war, was begun along a front of 28 miles. Ably commanded by Generals Mangin and Dégoutte, and, unannounced by the usual artillery bombardment, the Allied armies, protected by a creeping barrage and attended by tanks, penetrated far into the enemies' line before they realized the serious nature of the attack. Long accustomed to the offensive on their own part, the Germans were taken completely

by surprise. Mangin's troops reached the heights south of Soissons, and Dégoutte pushed his thrust far into the territory between the Ourcq and the Marne, making the German position in the salient untenable. On the 20th day they evacuated Château-Thierry and under terrific pressure withdrew several miles northward. But they were not allowed to stop. Within a week they were driven across the Ourcq, the Allies following in relentless pursuit, occupying the important town of Fère-en Tardenois on the 28th. At this point, the German resistance stiffened for a few days, Sergy and Seringes changing hands several times, but finally remaining in the hands of the Americans, who had taken over a section of the Allied line on the west when the offensive began. In the meantime Soissons too was recaptured by the French, who entered it on Aug. 3.

The Germans were now in full retreat recrossing the Aisne under the increasing pressure of the Allied advance. Scores of villages were recaptured, including Fismes, and nearly 50,000 prisoners captured. The dangerous threat of the Château-Thierry salient was wiped out, and the battlefront thrown back to a line extending northwestward from Reims through Fismes to Soissons. The Second Battle of the Marne was won.

In the narrow sense it ended then. In the broader sense it was only the beginning of the great battle which ended the World War; the beginning of the counter-offensive, which continued all through the succeeding months till the Germans were driven out of France and forced to sign the armistice of Nov. 11. All of the Allied forces on the west front, British, French, American and minor contingents of other countries, shared in the victory. W. E. Li.

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MAROT, CLÉMENT (c. 1497-1544), French poet, was born in Cahors, about 1497, the son of a secretary to Queen Anne of Brittany. He entered court life at an early age. In 1515 he presented to Francis I a long, rather pedantic poem, *Le Temple de Cupido;* four years later he became the *protégé* of the king's sister, Marguerite d'Angoulême. Marot was rightly suspected of Protestant sympathies, and in 1526 he was imprisoned as a heretic for a short time; while in prison he wrote the long, satirical poem *Enfer* or *Hell.* He was subsequently charged with heresy on several occasions, and in 1535 the poet fled to Ferrara, Italy, where he resided about a year at the court of Renée of France. About 1537 he was permitted to return to France, but in 1544 was again forced into exile. He died in Turin, Italy, in 1544.

Marot's most conspicuous work as a reformer was his translation into verse of the Psalms of the Bible. But his finest productions are undoubtedly his *Epîtres* or *Epistles,* lengthy, rhymed letters, worded with consummate wit and grace. Many of the *Epistles* are addressed to Francis I or to Marguerite d'Angoulême, in a tone that is strikingly familiar. The best known, however, is perhaps the *Epistle to Lyon Jamet,* containing the fable of the Mouse and the Lion. Marot was celebrated for his wit. The occasional pedantry of his early verse disappeared in his later work, which is gay and has natural charm. *See also* FRENCH LITERATURE.

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MARQUE AND REPRISAL, LETTERS OF. *See* LETTERS OF MARQUE AND REPRISAL.

MARQUESAS, or Mendana Islands, a group of volcanic islands of the Eastern Pacific, belonging to France. They are 13 in number and cover a total area of 480 sq. mi. The largest are Nukahiva and Hivaoa. These two are traversed through the center by mountain ridges which reach heights of 4,000 ft. above the water. The chief products are sugar-cane, bananas, bamboos, coconut palms, yams, bread fruit and copra. The Marquesas were discovered by the Spaniard, Mendaña, in 1595. France annexed them in 1842. Pop. 2,255.

MARQUETRY, an inlay of ornamental woods and other materials, used as a decoration for furniture, and originated in Italy in the 12th century. In making marquetry the parts are cut and fitted face downwards, after which paper is glued over them. The ground is carefully leveled, toothed and spread

TYPICAL MARQUETRY DESIGNS

with glue at a high temperature. The pieces of the pattern are then set in place and squeezed tightly together between frames until the glue hardens. Some of the woods are singed to obtain various tints. Besides wood, ivory, bone, metals, tortoise shell and mother-of-pearl are often used. Marquetry or *intarsia* as it was called, flourished in Europe during the 16th and 17th centuries, notably in Holland and France. Many 17th century English examples are Dutch importations. The great French cabinet-maker, ANDRÉ CHARLES BOULLE, was a marqueteur of superlative taste and skill. His designs range from flowers and arabesques to figures and landscapes with elaborate perspectives.

MARQUETTE, JACQUES (1636-75), French missionary and explorer in America, was born at Laon, France, in 1636. He entered the order of the Society of Jesus at 17 and in 1666 was sent to Canada as a missionary. In 1668 he founded the mission of Sault Ste. Marie. In 1673 he accompanied JOLIET on his expedition to rediscover the Mississippi. They set out, a company of 7 men, in two birch canoes, on

May 17th. After ascending to the Fox River and descending the Wisconsin they entered the Mississippi, just one month later. They continued south to latitude 33° 40′, a point slightly below where the Arkansas enters the Mississippi. Returning they paddled up the Illinois and perhaps portaged to Lake Michigan at or near the present site of Chicago. While attempting to establish a mission among the Illinois Indians, Father Marquette died in what is now west central Michigan close to a stream which bears his name, May 19, 1675.

MARQUETTE, a city of northern Michigan, the county seat of Marquette Co., situated on the southern shore of Lake Superior, about 300 mi. north of Milwaukee. It is served by four railroads, airplanes, bus lines and a seaplane base. Built on a high bluff above the lake, Marquette has a delightfully cool summer climate and is a popular vacation resort. Presque Isle Park is an added attraction. The city is a shipping center for one of the richest iron-ore regions in the world and has finely equipped ore docks. It is a port of entry of the Superior Customs District. The chief local manufactures are lumber, iron ore and chemical and planing-mill products. In 1929 the industrial output was worth $5,431,571. In 1929 the retail trade amounted to $7,313,001. Founded in 1845, under the name Worcester, the settlement was incorporated as a village in 1850; chartered as a city in 1871. Among the interesting historical places near by is the rock where Father Jacques Marquette landed. Pop. 1920, 12,718; 1930, 14,789.

MARQUETTE UNIVERSITY, at Milwaukee, Wis., a Jesuit institution, partly coeducational, was established as Marquette College in 1881 under a charter of 1864. It became a university in 1907 and now comprises colleges of arts and sciences and applied science and engineering, schools of medicine, dentistry (one of the largest in the United States), law and economics, including business administration and journalism, a nurses' training school, a conservatory of music, and preparatory, graduate, extension and summer schools. The Medical School has an endowment fund of $1,000,000, two-thirds of which the Carnegie Foundation donated. The university had endowment funds in 1931 totaling $2,858,839. Its library contained 59,000 books. The registration for 1931-32 was 3,420, and the faculty of 363 was headed by the Rev. William M. Magee.

MARQUIS, DONALD ROBERT PERRY (1878-), American poet, playwright and journalist, born at Walnut, Ill., July 29, 1878. For a number of years he worked on newspapers in Atlanta, Ga., and New York City and contributed humorous verse to magazines. He conducted a well-known column in the New York *Sun.* Among the most popular of Marquis's books are *The Old Soak,* 1921, *Noah and Jonah and Cap'n John Smith,* 1921, *The Revolt of the Oyster,* 1922, *Sonnets to a Red Haired Lady,* 1922, and *Archy and Mehitabel,* 1927.

MARRAKESH, Africa, southern capital of Morocco in the French protectorate. It is situated on an extensive stretch of ground, 1,447 ft. above sea level, about 5 mi. from the left side of the Tensift River. The principal trade is derived from several tanning and leather-dyeing organizations. A disintegrating wall, 5 mi. in circumference, encloses the town which is composed of many mosques, flat-roofed houses generally lacking windows and poorly paved and narrow streets. In spite of this, Marrakesh is an attractive city. Its picturesque environs have groves and gardens and a splendid view of the mountains. Pop. 1931, 193,852.

MARRAM (*Ammophila arenaria*), a stout perennial grass called also sea marram and beach grass. It grows in sands along the seacoasts of northern Europe, also from Newfoundland to North Carolina and along the shore of the Great Lakes. The tough rigid stem, 2 to 4 ft. high, rising from hard, scaly, creeping rootstocks, bears long, involute leaves and a dense flowering spike sometimes a foot in length. Marram is an important sand binding grass extensively used in Europe to hold in place barrier dunes along the coast. It has also been planted with successful results in America, as on Cape Cod, Mass., and at Golden Gate Park, San Francisco.



FROM JEPSON. MAN. FL. PLANTS CALIF., COPYR.

MARRAM

MARRANOS, designation for the thousands of Jews of Spain and Portugal who, during the period 1391-1415, were compelled to renounce their faith and accept Christianity. There had been Marranos in very small numbers in Visigothic Spain previously, also in France, Italy and Spain in somewhat larger numbers in the 13th and 14th centuries. These converts from Judaism to Christianity were officially called Conversos or Christiani Novi (New Christians). They were called also Crypto-Jews (Secret Jews), because, although they had been converted to Christianity by force, they still secretly practiced their ancestral religion and observed its rites, secretly teaching their children the knowledge of Judaism. It is with these backsliding Marranos that the chief work of the Spanish Inquisition, reestablished in 1480, was concerned. Its task was to ferret out and expose those Marranos who, while publicly professing Christianity, secretly practiced the laws and rites of their old faith.

The expulsion of the Jews from Spain in 1492 was brought about through the efforts of the chief Inquisitor Torquemada. Thousands of Marrano families, too, escaped from Spain and went to Turkey, Southern France, Italy and Holland. Amsterdam, London and Hamburg became the greatest European centers of the expatriated Marranos and of Spanish and Portuguese Jews, for some of them found their way into Portugal, whence in 1497, they were expelled. The remaining Marranos of Portugal were violently persecuted, especially in 1506, and after

further persecutions, thousands left the country for all time in 1580. During the remainder of the 16th and during the 17th century many more Marranos left Portugal for Northern Africa, Italy and Turkey, where they returned to Judaism. Those who remained in Portugal secretly continued to practice their original faith until modern times, whereas those of Spain disappeared entirely, within several decades, among the Christian population.

To-day there exist, in the northern, mountainous regions of Portugal, especially in the cities of Braganza, Covilha and Oporto, constantly increasing Marrano communities, which are slowly returning to Judaism openly. They keep only the Sabbath, Passover and the Day of Atonement, although their observance of these three holidays is quite different from that of traditional and modern Judaism. They have retained very few of the original rites of Judaism.

A. Sh.

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MARRIAGE, a social institution that has developed to regulate the union of the sexes and to add to the security of the Family. Although suggested by the behavior of some of the higher animals, it is a product of human experience and a long evolution. Even marriage, as it exists among the most primitive people, has developed beyond the beginning, so that its original form is speculative. Marriage is clearly a social pattern rather than any distinctive association, and is at present complex in its social function. Although it establishes the legal orthodox standard of sexual mating, it is not exclusively a sex regulation, for it has long had legal, political, educational and especially economic significance.

During the historic period monogamy has been a universal form and for the most part the orthodox form. Polygamy, or the marriage of more than one woman to one man, and polyandry, the marriage of several men to one woman, have been the competing forms of marriage. Even when monogamy has been standard, there have been at times and places variations including pre-nuptial intercourse, temporary relaxation of the marriage bond, concubinage and Prostitution. The term companionate has been applied to marriage contracted with the understanding of husband and wife that there were to be no children. This term has been used also by advocates of experimental unions, to be broken by the mutual consent of the two mates. Endogamy permits marriage only between members of a definite group, while exogamy requires marriage outside a particular group. The right of Divorce, or legal breaking of the union, has usually accompanied marriage, but there have been social groups, political units and religious organizations that have not permitted it. In the United States in 1930, 60% of the males 15 years of age and older were married, and 61.1% of the females. At that time 7.8% of the population 15 years old and older were widows. In 1890 it was 7.4%. During the same 40 years there has been an increase of 5.2% in the married population 15 years old and over. Although child betrothal and child marriage have not been uncommon in the past, there has been a marked trend away from them and toward increasing the age of consent.

E. R. G.

Marriage among primitive peoples is rarely a matter of individual choice. Two families decide on the marriage of a son of one with a daughter of the other, sometimes in the childhood of the young people or before their birth. Such families must conform with the tribal law as to relationship. (*See* Phratry; Exogamy.) Some tribes prescribe marriage with a particular type of cousin, as in Australia where a boy knows from childhood who must be his wife, age being no consideration. Relationship laws being complied with, the bride is arranged for by the payment of a bride price. This price does not so much purchase the woman as validate the new tie between the two families. Sometimes each family makes gifts to the other and sometimes a son and daughter of one family marry a daughter and a son of the other, the two payments thus canceling each other. The marriage ceremony itself is frequently of no importance, the main transaction being the payments, which may extend over years.

Elopement and marriage by capture are infrequent forms of marriage, occurring usually in combination with some other system. Forms of multiple marriage are found in some cases. Polyandry exists among the Eskimo, among the Bahima of East Africa, in Tibet and in Southern India. Polygyny is found in India, Africa, Australia, Polynesia, Siberia and among the American Indians. Usually the existence of polygyny does not mean that every man has several wives but that rich men avail themselves of the privilege, while poorer men can afford the bride price for only one wife. *See also* Levirate and Sororate.

Legal Aspects. In law, marriage is the civil status or position before the law of a man and a woman capable of entering into such a contract who have mutually engaged to live together as husband and wife. At Common Law, an informal agreement to marry in words of the present followed by cohabitation sufficed, and in jurisdictions where not abolished by statute this is called a common-law marriage. Statutes generally require a license issuing from a public authority and solemnization pursuant to the license either by a minister of the Gospel, or by some public functionary, together with a return showing what has been done under the license. But legislation varies with respect to the effect of non-compliance with these requirements, and the local statutes in each jurisdiction must be consulted. If the parties or either of them are not competent to contract marriage, as, for instance, by reason of relationship, nonage, or mental infirmity, or the marriage was brought about through fraud or duress, a proceeding may be brought to annul it, otherwise the marriage relation can be terminated only by death or divorce. In some states,

however, imprisonment of one of the spouses for life operates as civil death and may terminate the relation.

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MARRIAGE OF FIGARO, THE, a comic opera in four acts by WOLFGANG MOZART, libretto by Lorenzo da Ponte, after the comedy by Pierre Beaumarchais; première, Vienna, May 1, 1786; first produced in the United States, May 10, 1824, at New York. The opera is an attack on the institutions of eighteenth-century autocracy. The action deals with the preoccupations of the aristocratic Count Almaviva with the gardener's daughter and his infatuation with Susanna, pledged to Figaro. The frailties of the count are revealed by a succession of comic exposures. Despite the tangle of cross purposes, the action ends with the marriage of Figaro and Susanna. Production of the opera was prohibited on several occasions in Austria and France, where its underlying social criticism offended the reactionary aristocracy.

MARRYAT, FREDERICK (1792-1848), English navy officer and writer, was born at Westminster, July 10, 1792. At 14 he entered the navy and served with distinction, retiring in 1830. He became equerry to the Duke of Sussex, editor of the *Metropolitan Magazine,* in which a number of his stories appeared. He visited America in 1837, and his impressions appear in his *Diary.* Among Marryat's most popular books are *Peter Simple, Midshipman Easy* and *Japhet in Search of a Father* and *Masterman Ready.* He died at Langham, Aug. 9, 1848.

MARS, in Roman mythology, the god of war, the same as the Greek ARES. He was a son of JUPITER and JUNO. Mars ranked next to his parents among the gods. At Rome a temple and altar were erected to the god in the Campus Martius, also outside the Porta Capena. Under the name of Quirinus, Mars was worshiped as protector of the state.

MARS, the fourth planet of the solar system in order of distance from the sun. It revolves in an orbit lying immediately outside that of the earth and takes 687 days to complete its circuit around the sun. Its mean distance from the sun is 142 million miles. The orbit of Mars is very eccentric, however, and its actual distance from the sun varies from 128 to 154 million miles. Its distance from the earth varies between 35 million and 234 million. When at its nearest, Mars appears brighter than any star or planet in the sky except Venus. The color of its light is red and fiery, which accounts for its name, that of the war-god of the Romans. Its diameter is 4200 miles, slightly more than half that of the earth, while its volume is 0.15. Its mass is 0.11 that of the earth, its density is nearly 4 times that of water. Like the earth, it is not entirely spherical, but flattened at the poles by about 1/190. It rotates on an axis in $24^h\ 37^m\ 22^s.58$, with an uncertainty of only a few hundredths of a second. As its axis of rotation makes an angle of 24° with the perpendicular to the plane of its orbit, the seasons on Mars are much the same as they are on the earth.

Mars has two satellites, Phobos and Deimos, both exceedingly small, no more than 10 and 5 miles in diameter, respectively. Phobos revolves around the planet at a distance of but 3700 miles from the surface in $7^h\ 39^m$, less than one-third of the Martian day, rises in the west and sets in the east. Deimos revolves in 30 hours at a distance of 12,000 miles. Viewed through a telescope Mars shows a number of markings on its surface, the most conspicuous of which are two white spots around the poles. The explanation that they are polar ice caps receives support in the fact that they can be seen to grow and diminish with the change of seasons.

The surface markings of Mars consist chiefly of large light and dark areas and a maze of very fine black, straight lines, called *canali* in Italian, and mistranslated into English as canals. The existence of these canals, as well as the constant changes observed in them, led to their being interpreted as irrigation ditches—the handiwork of a race of intelligent beings on Mars, who thus sought to utilize the water from the polar regions to make arable the desert regions of the equator. Although it is far too early to draw such far-reaching conclusions at the present time, modern observations have shown that the conditions on Mars might support a life not dissimilar to that known on earth.

Mars undoubtedly has an atmosphere containing oxygen, though it is much more rarefied than on earth, and possesses some water, either liquid or in the form of snow and ice, though most of the surface is as dry as the Sahara desert. Its temperature shows great variations, that at the equator being probably about 50° at mid-day but always below freezing at sunrise and sunset and very cold at night, while the polar caps are probably as cold as —100° F. W. J. L.

MARSEILLES, the second city and chief seaport of France, and the foremost port on the Mediterranean. It was the site of the flourishing colony of Massilia established by the Greeks about 600 B.C. but probably settled earlier by the Phoenicians. Conquered by the Romans, then by various invaders it attained feudal autonomy and in 1481 was united to France. Marseilles remained generally royalist during the revolution, although it was the Marseillaise battalion that made Rouget de Lisle's marching song famous at the storming of the Tuileries. The port's commercial prosperity was much enhanced by the French conquest of Algiers in 1830 and the opening of the Suez Canal in 1869. The irrigation canal pierced in 1848 from the Durance River 100 mi. away greatly benefited the city. Marseilles is the port for many steamship lines, the French gateway to the Orient and the base for African trade. It is an important industrial center, its soap being especially well known. In recent years harbor improvements and outlets for further development have been set under way. Among the few remains of its medieval past is the Château d'If located on a small island near the harbor and made famous by DUMAS in *The Count of Monte Cristo.* Pop. 1931, 800,881.

MARSEILLES-RHÔNE CANAL, a ship canal in France, providing a link between the Rhône River at Arles and the Bay of Marseilles, covering a distance of 48 mi. The width of the canal is 82 ft., the depth 60 ft. At Arles there are a series of locks 525 ft. long and 52 ft. wide. A tunnel, 4½ mi. long, burrowed through the rock of the Nerthe range at Rove and a breakwater construction between the Port de Bone and Marseilles and another in the Étang de Berre were among the intricacies involved in the construction of the canal. This artificial waterway runs at sea level throughout its entire course, and with its confluents forms a succession of channels having a length of 350 mi. The Marseilles-Rhône Canal was commissioned in 1903, constructed in greater part during the World War, and only partially completed in 1928 at an approximate cost of $20,000,000. Barges are the only vessels permitted passage through this canal.

MARSH, DANIEL L. (1880-), American educator, was born in West Newton, Pa., Apr. 12, 1880. He graduated from Northwestern University in 1906 and did graduate work at the universities of Chicago, Pittsburgh and Geneva (Switzerland). In 1903 Marsh entered the Pittsburgh Conference of the Methodist Episcopal Church. From 1913-19 he was general superintendent of the Methodist Episcopal Union at Pittsburgh, and from 1916-26 occupied a pastorate in that city. Marsh became president of Boston University in 1926.

MARSH, OTHNIEL CHARLES (1831-99), American palaeontologist, was born at Lockport, N.Y., Oct. 29, 1831. He was educated at Phillips Academy, Andover, and Yale, where he was graduated with great distinction in 1860 and after graduate work studied widely in Europe. He became the first American professor of palaeontology, at Yale in 1866. In 1868 a trip over the newly built Union Pacific convinced him of the great palaeontological finds possible in the west and in 1870 he assembled an expedition and led others thereafter until 1874. Modern knowledge of the fauna of the Tertiary and Eocene is to a remarkable extent based on the finds, and to a somewhat lesser extent the classifications, of Marsh. In 1882 Marsh became vertebrate palaeontologist of the U.S. Geological Survey, still retaining his professorship at Yale. He died at New Haven, Conn., Mar. 18, 1899.

MARSH, low, wet land, either treeless fresh-water swamps, or salt meadows, submerged only at the highest tide. Salt marshes form in lagoons of quiet water behind a sandbar, where eelgrass gets a footing, checking the currents and favoring the deposit of silt. Eventually a mudflat develops, exposed at low tide. Eelgrass is replaced by marsh grasses, which, dying down annually, produce peat accumulations that gradually build up the floor, until the lagoon is wholly or in large part, converted into a marsh, drained by tidal streams. Salt-grass, called "bent," is cut for hay. The salt marsh near Newburyport, Mass., developed behind the shelter of Plum Island.

MARSHAL, a title applied to various civil and military officials. In the United States marshal is not a military title but is applied to an officer of the Federal courts. A marshal is usually appointed for each judicial district to open and close sessions, and serve warrants. In some states he is the town or village police officer.

In France the title is given to the highest ranking officers in the army.

MARSHALL, ALFRED (1842-1924), English economist, was born at London, July 26, 1842. In 1885 he became professor of political economy at Cambridge and in 1891 member of the Royal Commission on Labor. Marshall maintained, against the dicta of other economists of the 19th century, that the so-called laws of economics were not inflexible, but necessarily changed with changing trade circumstances. Among his writings were *Principles of Economics,* 1890, *Elements of Economics of Industry,* 1892. He died at Cambridge, July 12, 1924.

MARSHALL, JOHN (1755-1835), American jurist and chief justice, was born at Germantown (now Midland), Farquier Co., Va., Sept. 24, 1755. He was the son of Thomas Marshall, a soldier who distinguished himself in the Revolutionary War. In youth Marshall attended several country "academies," and was tutored in history and literature by his father. His later training consisted solely of a limited number of lectures on law and philosophy at William and Mary College. The war interrupted further studies, and Marshall, after enlisting and winning a captaincy, participated in numerous major engagements, including the capture of Stony Point, N.Y. During 1780-81 he studied law and began practice in 1782. In that year he was elected to the Virginia legislature from Richmond, Va., where he had established himself, reelected in 1784, and four years later he was a delegate to the State convention called to ratify the federal Constitution. With JAMES MADISON, Marshall shared the distinction of securing Virginia's ratification. He maintained that a strong federal government was vital to the union, and the vigor of his argument in support of this stand recommended him to Washington for a government post. He declined the Attorney-Generalship in 1789, but went to France as a special envoy. In 1795 Marshall was reelected to the Virginia legislature, and four years later he entered Congress, becoming administration leader in the lower house. At this time his authority on constitutional issues was unquestioned. In 1800 he was appointed Secretary of State, and the following year made Chief Justice of the Supreme Court, a post he held until 1835. In this office Marshall brought to the court the dignity and authority which it had lacked, and his opinions handed down in such cases as McCulloch vs. Maryland established the tribunal as the sole interpreter of the Constitution. He died at Philadelphia, Pa., July 6, 1835.

MARSHALL, LOUIS (1856-1929), American lawyer, was born at Syracuse, N.Y., Dec. 14, 1856. He attended Syracuse schools and Columbia Univer-

sity, and began to practise law in 1878. Early in his career his chief interest was constitutional law, and he was a delegate to the New York constitutional conventions of 1890, 1894 and 1915. His eminence in this field brought him a growing practice before the United States Supreme Court. In 1902 he was appointed by Mayor Low of New York to investigate living conditions on the East Side, and in 1908 he was made chairman of the State Immigration Commission. He took a leading part in the movement to annul the Treaty of 1832 with Russia. At the Versailles Conference in 1919 he was instrumental in negotiating treaties with Poland, Rumania, Czechoslovakia and Yugoslavia. He died at Zurich, Switzerland, Sept. 11, 1929.

MARSHALL, THOMAS RILEY (1854-1925), American lawyer and statesman, was born in North Manchester, Ind., Mar. 14, 1854. He received his A.B. and A.M. degrees from Wabash College in 1873 and 1876. He was admitted to the bar and practiced law in Columbia City from 1876 to 1909. From 1909 to 1913 he was governor of Indiana. As governor he called himself "a progressive with the brakes set." He stood for the direct election of senators, opposing woman suffrage and favoring the LEAGUE OF NATIONS. In 1912 at the Democratic National Convention he was nominated vice-president on the ticket with WOODROW WILSON, elected, and reelected in 1916. During the first two years of the war he advocated neutrality, but changed his attitude later. In 1922 he was a member of the United States coal commission. He died in Washington, D.C., June 1, 1925.

MARSHALL, a city in southern Michigan and the county seat of Calhoun Co. It is situated on the Kalamazoo River, and served by bus lines and the Michigan Central Railroad. The city lies in a good farming district. The local manufactures include furnaces, iron castings and store fixtures. Marshall was incorporated in 1859. Pop. 1920, 4,270; 1930, 5,019.

MARSHALL, a city in northwestern central Missouri, the county seat of Saline Co., situated on the Salt Fork of La Mine River. There is an airport and aviation school. Two railroads afford transportation. The region is good farming country. Airplanes, shoes, condensed milk and other products are manufactured in the city. Located here are Missouri Valley College and the State Colony for the Feeble-Minded and Epileptic. Marshall was founded in 1836 and incorporated in 1856. Arrow Rock State Park is a few mi. east. Pop. 1920, 5,200; 1930, 8,103.

MARSHALL, a city and the county seat of Harrison Co., in northeastern Texas; it is situated 150 mi. southeast of Dallas. The city is served by bus lines and two railroads. There are landing fields for airplanes. Cotton, truck and dairy products are the leading agricultural interests, and its proximity to the East Texas Oil Fields has made it a business center. Powdered milk, clay products, boxes and crates, chairs, car wheels and railroad shop products are among its chief manufactures. In 1929 the value of the factory output was about $7,000,000; the retail trade amounted to $8,283,055. The city was founded in 1840. During the Civil War Governor Reynolds of Missouri made Marshall the capital of his state, from which he had fled before the advancing Union troops. Lucy Holcombe Pickens, founder of the Lucy Holcombe Legion, an organization of Confederate soldiers from South Carolina, was born in Marshall. Pop. 1920, 14,271; 1930, 16,203.

MARSHALL ISLANDS, a group of islands in the Pacific Ocean, consisting of two chains, the Ratack, with 13 islands, and the Ralick, with 11 islands. The total area is about 158 sq. mi. Jaluit is the principal island and administrative center. Copra, sugar and cotton are the main products. The group belonged to Germany from 1885 until the World War, and in 1919 it was mandated to Japan together with other Pacific islands north of the Equator. Pop. 9,678.

MARSHALLTOWN, a city in central Iowa, the county seat of Marshall Co., situated 69 mi. northeast of Des Moines, on the Iowa River. Bus and truck lines and three railroads afford transportation. The countryside produces farm crops and live stock. The principal manufactures are canned foods, furnaces, engines and machinery. In 1929 the factory output was approximately $12,000,000; the retail trade amounted to $11,580,139. The city, founded in 1853, became the county seat in 1860. In 1868 Marshalltown was chartered as a city. Both county and city were named for Chief Justice Marshall. Pop. 1920, 15,731; 1930, 17,373.

MARSHFIELD, a port city near the southwestern coast of Oregon, situated on Coos Bay, 244 mi. southwest of Portland. Steamships, bus lines and the Southern Pacific Railroad serve the city. There is an airport. Marshfield is a trade center in a lumbering and dairying region and a shipping center for coal, lumber, bent grass seed, fish and other products. The chief industry is lumber milling and wood working; there also are fish-packing houses and cheese, veneer and other factories. To the north is Sinslaw National Forest and to the south Siskiyou National Forest. Marshfield was founded in 1852 and incorporated in 1874. Pop. 1920, 4,034; 1930, 5,287.

MARSHFIELD, a city in Wood Co., central Wisconsin, situated 35 mi. southwest of Wausau. Bus and truck lines and three railroads serve the city. There is an airport. Dairying is carried on in the vicinity, especially cheese making. Marshfield is a manufacturing center, its products including veneer, furniture, electric signs, culverts, tanks and gloves. Marshfield was settled in 1866 and incorporated in 1883. Pop. 1920, 7,394; 1930, 8,778.

MARSH GAS, a gas consisting chiefly of METHANE, produced in marshes by the decay of plant matter in water. It is also found in coal mines, as a constituent of coal gas and is there called fire damp.

MARSH HAWK, the name commonly given in North America to the marsh harrier, a medium-sized hawk frequenting marshes and low meadows. *See also* HARRIER; HAWK.

MARSH MALLOW (*Althæa officinalis*), a perennial herb of the mallow family cultivated for its profuse showy flowers. It is native to Europe and naturalized in marshes near the seacoast in the eastern United States. The plant, which is covered with a thick velvet-like down, grows 2 to 4 ft. high bearing usually three-lobed leaves and attractive pink flowers in narrow, terminal or axillary clusters. The mucilaginous roots are used in confectionery and as a demulcent in medicine.

MARSH MARIGOLD, a genus (*Caltha*) of handsome marsh plants of the crowfoot family. There are about 20 species native to the temperate and arctic regions of both hemispheres, some 10 occurring in the United States. They are smooth herbs, rising from perennial rootstocks, bearing simple, mostly basal, heart-shaped or ear-shaped leaves and yellow, white or pink blossoms. The common marsh marigold (*C. palustris*), with showy bright yellow flowers, grows abundantly in wet places from Newfoundland to South Carolina and westward to Saskatchewan and Nebraska; it is found widely also in Europe and Asia. The tender leafy portions of the plant are often used as a spring vegetable.

MARSTON, JOHN (c. 1575-1634), English dramatist and satirist, was born in Coventry, 1575 or 1576, and graduated from Oxford in 1594. His earliest known work, *The Scourge of Villany,* 1598, was ordered burnt by the Archbishop of Canterbury, and for his play, *Eastward Hoe,* 1605, he was imprisoned. His chief works are *Antonio and Mellida,* 1602; *The Malcontent,* 1604; *The Dutch Courtezan,* 1605; *Parasitaster,* 1606, and *What You Will,* 1607, in which he attacked Jonson. Marston's verse is modeled upon that of CHRISTOPHER MARLOWE. On his entering the Church he was presented to the living of Christchurch, Hampshire, 1616. He died at Aldermanbury, London, June 25, 1634.

MARSTON MOOR, BATTLE OF, an engagement fought on July 2, 1644 between the Royalist troops of Charles I, under Prince Rupert, and the Parliamentary forces, led by Lord Fairfax and Lord Leven. Oliver Cromwell, a lieutenant general, was prominent in the fighting. The battle began in the evening when Prince Rupert allowed his soldiers to relax, and departed himself. Cromwell immediately advanced with the front line. Rupert returned and repulsed Cromwell with his famous cavalry which was later defeated. By the end of the battle, the entire Royalist army of the north, excepting about 6,000 men who escaped with Rupert, was annihilated.

MARSUPIALIA, the scientific name for an order of mammals. The term is also used for the subclass to which it belongs, as the latter contains only the one order. Typical marsupials are characterized by their possession, in the female, of a brood pouch or marsupium in which the young, born at a very immature stage, grow until capable of living an independent existence. Not all marsupials have this pouch.

The class occupies a position intermediate between the monotremes, or egg laying mammals, and the placental mammals. This does not mean, however, that the placentals are offspring of the marsupials. More likely they represent a primitive branch of the mammalian stock.

Most marsupials are found in Australia, where they have undergone an extensive development that resulted in types which occupy similar positions to, and, in many cases, superficially resemble, the placental mammals of the world at large. Examples are the pouched mole, the "native badgers" or wombats, the squirrel-like phalangers, the rabbit-like bandicoots, and the marsupial wolf. The only known semi-aquatic marsupial is the water opossum or yapok of Panama.

Perhaps the best known member of its class is the kangaroo. North America has one representative, the familiar opossum. *See also* BANDICOOT; KANGAROO; PHALANGER; OPOSSUM; WALLABY; WOMBAT. A. I. W.

MARSYAS, in Greek legend a satyr who picked up the flute which the goddess ATHENA had invented but thrown away. Being still full of the goddess' breath, the instrument gave forth such enchanting strains that Marsyas was emboldened to challenge APOLLO to a contest of musical skill. Being defeated, the presumptuous satyr was flayed alive. A celebrated group of bronze statues by the sculptor Myron, that stood on the Acropolis at Athens, represents Athena looking over her shoulder with a warning gesture, and Marsyas, startled, drawing back for the moment. A marble copy of this Marsyas was found on the Esquiline Hill, and is now in the Lateran Museum, Rome. Another famous statue shows Marsyas tied to a tree. The contest was also pictured by Praxiteles on the base of some statuary at Mantinea.

MARTEL, CHARLES. *See* CHARLES MARTEL.

MARTEN (*Martes*), a name applied to several carnivorous mammals native to America, Europe and Asia, closely related to the weasels and highly prized for their fur. As in the weasels, the body is elongated and lithe, and the legs are short. The American sable or pine-marten (*M. americana*) somewhat resembles a young red fox. It is about 17 in. long, with the tail adding another 7 in. The extremely soft and full reddish-brown fur consists of three different lengths of hair, a short wool-like growth close to the skin, the second of the same texture but longer and curlier, and the third of fewer, still longer, stiff and glossy hairs, bristly to the roots. Incessant trapping has almost exterminated the marten in the United States. Martens live in trees in dense forests, but descend to the ground in search of their prey, preferably hare, grouse and squirrels.

MARTHA, an opera in four acts by FRIEDRICH VON FLOTOW, libretto (based on a ballet pantomime by Vernoy and St. Georges) by Wilhelm Friedrich Riese; première, Vienna, 1847, New York, 1852, London, 1858, Paris, 1865. The genial melodies of the opera brought it almost instant popularity in all countries.

Bored with court life, Lady Harriet Durham, maid of honor to Queen Anne, decides to cast aside the

plush of court life for simple homespun. She goes to the Richmond fair as a simple peasant, mingling with the townsfolk, and accompanied by her maid Nancy. They are joined by Sir Tristan of Mikleford, a pompous old cousin. Martha, Nancy and Sir Tristan arrive at the fair grounds where the country girls are selling their services on a year's contract. Martha and Nancy, approached by two attractive farmers, enter into a contract as servants to Plunkett and his foster-brother Lionel. Despite the horror-struck expostulations of Sir Tristan, the women are transported from the fair grounds by their new employers, but at the farmhouse they rebel at their menial tasks. Their predicament is only relieved by the fact that Lionel, remarkably



MARTEN OR FISHER

courtly for a farmer, is smitten by Martha, while Plunkett is much taken with Nancy. Sir Tristan helps the women escape through a window and takes them back to court in his carriage. There it develops that Lionel is a son of the banished earl of Derby, and a ring given him by his father is the proof. Since he belongs to the nobility, Lady Harriet considers his former suit seriously but he, rebuffed once, believes that she is only trifling with him. But the difficulties of the couple are soon resolved, and Plunkett and Nancy are also united in marriage.

MARTHA'S VINEYARD, an island in the Atlantic Ocean, situated about 4 mi. south of Cape Cod, Mass., from which it is separated by Vineyard Sound. Bartholomew Gosnold discovered and named Martha's Vineyard in 1602. Its area is approximately 100 sq. mi., being about 20 mi. long and 9 mi. wide, and varying in topography from hills and bluffs on the north to lagoons and sand bars on the south. EDGARTOWN and OAK BLUFFS are popular summer colonies. At one time the U.S. government established an Indian Reservation near Gay Head Light, on the western end of Martha's Vineyard. The reservation was later abolished but an Indian settlement remains.

MARTI, JOSÉ (1853-95), Cuban liberator and poet, born of humble Spanish parents. Early he showed himself to be a critic of Spanish policy in Cuba and a propagandist for the freedom of the island. Exiled to Spain he devoted himself to study and graduated in law, receiving a doctor's degree in 1873. After the peace of Zanjon (1878) he returned to Havana where he stirred up sentiment in behalf of liberty and was exiled again to Spain from which he escaped. He eventually returned to New York City and became a newspaper editor and correspondent. In New York, with Tomas Estrada Palma, Marti pushed the preparations for a war for Cuban freedom and in 1895 issued a declaration of independence and set up a government for the "republic of Cuba." This "tragic symbol of liberty," José Marti, was killed in the war for freedom. As a poet, soldier, essayist and revolutionary Marti is considered by Cubans one of the greatest heroes of their independence.

MARTIAL (c. 38-104 A.D.), Roman epigrammatist, more properly known as Marcus Valerius Martialis, was born at Bilbilis, Spain, about 38 A.D. In 64 he went to Rome, where he gained a reputation as a wit and poet. Several wealthy persons became his patrons, and he also received favors from the emperors Titus and Domitian, who raised him to the equestrian rank. Among his friends were some of the leading literary men of Rome, including Juvenal, Quintilian, Pliny the Younger and Valerius Flaccus. All of Martial's extant writings are included in 14 books, called collectively the *Epigrammatica.* The first 12 books consist of nearly 1,200 epigrams; the 13th and 14th contain 350 distichs. Besides their literary merit, these works are of great historical importance, as they shed much light on the Roman life and customs of the time. Martial's epigrams are ranked among the greatest ever written. In 98 A.D., the poet left Rome for his native Bilbilis, where he died probably in 104.

MARTIAL LAW. Under normal conditions in the United States the functions of government are exercised by civil officials; and the powers and duties of the military authorities are limited in their application to the personnel and property of the military establishment. However, when by reason of organized opposition, forcible resistance or overwhelming public disorder, the civil arm of the government becomes paralyzed and unable to execute the laws and preserve order, the military authorities may and do intervene to protect life and property and to reestablish and maintain order. The justification of such an exercise of extraordinary powers is necessity—the fact that the ordinary agencies of government are for the time being unable to exercise the functions of government. With the passing of the emergency the justification of martial rule terminates, and it becomes the duty of the military authorities to hand the reins of power back to the civil authorities. The principles and rules

under which the military authorities in the United States control temporarily the civil population of a state, territory or district in a state of INSURRECTION justifying such action, and which determine the limits of their powers, constitute martial law. Martial rule does not abrogate all law. Its purpose is to do what is necessary to meet an existing emergency, to restore public order and to enable the civil authorities to resume their normal functions and accomplish the purposes of government. E. A. K.

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MARTIN, ST. (c. 316-400), bishop of Tours, was born at Sabaria in Pannonia about 316. Although born of pagan parents, he was converted to Christianity and lived for a while as an ascetic hermit on a lonely island near Genoa. He soon turned to missionary work, however, and was so successful that he was chosen bishop of Tours in 372. He was instrumental in founding monasteries and spreading the monastic system through France. Martin died at Candes in France about 400, his feast day being celebrated on Nov. 11.

MARTIN, HENRI (1810-83), French historian, was born at Saint Quentin, Aisne, in 1810. He wrote historical romances and poetry, and won fame with his 15-volume *Histoire de France* (1833-36). An enlarged edition published later won for him a prize from the Academy of Inscription. Martin was a member of the National Assembly from Aisne in 1871, and seven years later became a life senator. He died in Paris, Dec. 14, 1883.

MARTIN, HOMER DODGE (1837-97), American landscape painter, was born at Albany, N.Y., Oct. 28, 1836. He was much influenced by the Barbizon School of landscape painters. With GEORGE INNESS and A. H. Wyant he headed the AMERICAN SCHOOL OF LANDSCAPE PAINTING. Martin died at St. Paul, Minn., in Feb., 1897.

MARTIN, RICCARDO (Hugh Whitefield Martin) (1879-), American tenor, was born at Hopkinsville, Ky., Nov. 18, 1879. After music studies with EDWARD MACDOWELL at Columbia University, he studied singing under Irrgung in Berlin, Carelli in Naples, Lombardi in Florence, and Sbriglia in Paris. His operatic début was as Faust at Nantes, France, in 1904. He sang at Verona and Milan, and in 1906 at the French Opera, New Orleans, appearing also at the Metropolitan Opera, New York, during 1907-15, at Covent Garden, London, in 1910-11, and at Mexico City in 1910. His most notable operatic successes have been in *Faust* and *Madame Butterfly.*

MARTIN, the common name for an American genus (*Progne*) of birds of the swallow family. The best known is the handsome purple martin (*P. subis*), breeding widely throughout temperate North America and wintering southward to Venezuela and Brazil. It is about 8 in. long and larger than most swallows. The male is shining blue-black throughout; the female is duller above with gray below. Although formerly abundant about towns and villages, moving in flocks and nesting in colonies usually in bird houses especially prepared for it, the purple martin has largely disappeared from localities where the house sparrow is common. The purple martin feeds chiefly on insects, catching them on the wing. It builds a nest of twigs, straw and feathers, laying four or five white eggs.

MARTINEAU, HARRIET (1802-76), English writer, was born at Norwich, June 12, 1802. Her *Illustrations of Political Economy,* 1831, attracted attention, and the following year she met in London the most famous writers of the day. She visited America in 1834, and later toured Syria and Egypt. Among her writings are *Society in America, Eastern Life, Present and Past* and many articles. She died at Ambleside, June 27, 1876.

MARTINEAU, JAMES (1805-1900), English Unitarian clergyman and brother of HARRIET MARTINEAU, was born at Norwich, Apr. 21, 1805. He graduated from Manchester College in 1827. After serving as a minister in Dublin and Liverpool, he became professor of mental and moral philosophy at Manchester New College in 1840. This college was moved to London in 1853, and Martineau, taking up residence in the city, preached at the Little Portland Street Chapel. From 1868 to 1885 he was principal of Manchester New College. Among his publications, which were widely read at the time, are *Endeavors after the Christian Life,* 1843-47, and *Types of Ethical Theory,* 1885. Martineau died at London, Jan. 11, 1900.

MARTINELLI, GIOVANNI (1885-), Italian tenor, was born at Montagnana, Oct. 22, 1885. His first operatic appearance was as Ernani, at Milan, in 1910. He sang Rodolfo in *La Bohème* upon his American début at the Metropolitan Opera, New York, in 1913, where he created, among many others, the rôles of Lefebre in Giordano's *Goyescas.* In 1930-31 he fell heir to Caruso's rôle in Puccini's *Girl of the Golden West.*

MARTINEZ, a city in western California, the county seat of Contra Costa Co., on the Carquinez Straits and Suisun Bay, 25 mi. northeast of Oakland. Steamships, bus lines and the Southern Pacific and Santa Fe railroads afford transportation. There is an airport 6 mi. from the city. Martinez is a trade center in an important fruit and walnut growing region. The chief manufactures are oil and mineral fertilizer products, veneer and lighting fixtures. Martinez was founded in 1849 and incorporated in 1853. It is situated on the picturesque Martinez-to-Port Costa Highway, a short distance from Mt. Diablo State Park. John Muir, the naturalist, made Martinez his home for many years. Pop. 1920, 3,858; 1930, 6,569.

MARTINIQUE, a French island in the West Indies, situated about 30 mi. southeast from Dominica and about 20 mi. north of St. Lucia. It is 40 mi. long and has a breadth of 15 or 20 mi. Its area is 385 sq. mi. Martinique is of volcanic origin, huge rocky

hills covering the interior. Some of the mountains rise to 5,000 ft. above the sea. Pelée, the loftiest of these, in an eruption in 1902 destroyed the city of St. Pierre together with some 30,000 inhabitants.

Tobacco, coffee, pineapples and bananas are grown in abundance. Of the industries sugar refining and rum distilling are the most important, there being 15 sugar works and well over 100 agricultural and industrial distilleries. In 1927 Martinique produced more than 40,000 metric tons of sugar and about 5,000 gal. of rum. Fort-de-France is the capital and the finest harbor. Other important towns are Marin, Galion, Robert and Trinité.

Martinique was discovered by the Spaniards about the end of the 15th century and settled by the French in 1635. From that time until 1814, when it was definitely restored to France, it changed hands between France and Great Britain several times. Pop., 1927, 234,695.

MARTINSBURG, a city of the eastern panhandle section of West Virginia and county seat of Berkeley Co., 65 mi. (direct) northwest of Washington, D.C., on the main line of the Baltimore and Ohio and the Pennsylvania railroads. The shipping center of a productive apple region, it has large apple products plants. Hosiery and knitting mills are the outstanding industrial establishments. In 1929 the value of the factory output was about $10,000,000; the retail trade amounted to $7,437,380. Quantities of limestone are quarried within a five-mile radius. Martinsburg is the northern gateway to Shenandoah Valley, and accessible to such historic spots as Harpers Ferry, Charles Town, scene of John Brown's trial and execution; Shepherdstown, oldest town in West Virginia, where James Rumsey invented and tested the first steamboat; Antietam and Gettysburg battlefields, and Berkeley Springs, a colonial watering-place. The town was plotted in 1774, and incorporated 1778. Pop. 1920, 12,515; 1930, 14,857.

MARTINS FERRY, a city of eastern Ohio, in Belmont Co., on the Ohio River, spanned here by a bridge between Martins Ferry and Wheeling, W. Va. The Wheeling and Lake Erie, the Pennsylvania, and the Baltimore and Ohio railroads, and Scott Field, a privately-owned airport 3 mi. to the north, serve the city. It is an industrial center of a coal-mining district supplied with natural gas, and manufactures sheet-iron, steel, tin, glass and other products, having an approximate valuation of $24,000,000 in 1929. The retail trade in the same year amounted to $3,887,469. Martins Ferry is the setting for Zane Grey's novel, *Betty Zane,* about the Revolutionary War heroine who was burried here. It was the birthplace of William Dean Howells. The town, replotted in 1835 on the site of former settlements in 1785 and 1795, was incorporated in 1865, and became a city in 1885. Pop. 1920, 11,634; 1930, 14,524.

MARTIN'S SUMMER, ST., the second or autumnal summer, called also All Saints' or Allhallow Summer, but most commonly known in America as Indian Summer. November 11 is St. Martin's Day.

MARTINSVILLE, a city in southern Virginia, the county seat of Henry Co., situated on Smiths River, 52 mi. south of Roanoke. It is served by two railroads. Martinsville is a trade market for tobacco, dairy products, livestock and lumber. The city has many factories, manufacturing cotton, silk and woolen products, furniture and various other articles. It was settled in 1830 and incorporated in 1873. Martinsville is growing rapidly owing to its industries. Pop. 1920, 4,075; 1930, 7,705.

MARTYN, EDWARD (1859-1923), Irish writer, was born at Masonbrook, County Galway, Jan. 31, 1859, and was educated at Oxford. He was one of the leading spirits of the Irish dramatic revival, and one of the founders of the Irish Theater in 1914. He also founded the Palestrina Choir, and was president of Sinn Fein from 1904-08. Among his publications are *Maeve, The Tale of a Town* and *An Enchanted Sea.* He died at Ardrahan, County Galway, Dec. 6, 1923. *See also* Irish Theater.

MARTYR (a Greek word, meaning witness), one who suffers death at the hands of a persecutor rather than deny his faith. The term was first used by Christians in its literal sense, but during the 1st century, as believers confessing their faith were frequently executed, it acquired its present meaning. Many desired the martyr's crown, believing that martyrdom could atone for sin and was the equivalent of sacramental baptism. Imprisoned Christians, regarded as inspired, granted pardons to those excommunicated by the clergy and, if they finally escaped death, were admitted to the priesthood without ordination. In Phrygia and Africa fanatics sought martyrdom by civil insubordination and acts of sacrilege. By the middle of the 2nd century the bones of the martyred St. Polycarp were revered as "more valuable than precious stones and finer than refined gold," and the anniversaries of the deaths of martyrs were considered occasions for special worship. In the 3rd century it was customary to celebrate Mass on the tombs of martyrs and Felix I made this obligatory. In the Eastern churches the dividing and translating of relics was practiced at an early date, but in the West the old Roman idea of the inviolability of tombs prevailed until the end of the 6th century. Subsequently faith in the wonder-working properties of holy bodies overruled all other considerations. Today every altar in the Roman Catholic Church must contain the relics of martyrs.

MARTYROLOGY, that branch of ecclesiastical history which deals with the lives and sufferings of the martyrs of the Christian Church. In general it treats of all religious martyrs, such as those who suffered under the persecutions of the Roman Empire, those who died at the hands of pagan uncivilized tribes and those who were martyred by their fellow Christians of a different creed. Martyrology may treat of primitive Christians, Roman or Greek Catholics, or Protestants and Christians of no denominational affiliation. In the Roman Catholic Church, martyrology refers specifically to the official catalogue

or register of the martyrs and saints arranged according to the dates of their feasts. The Martyrs' Calendar dates from the era of Diocletian, A.D. 284. In the early Christian centuries local churches had their special martyrologies, which later centuries combined. There still exists, for example, the martyrology or ferial of the Roman church of the middle of the 4th century, containing two separate calendars, the *Depositio martyrum* and the *Depositio episcoporum.* The most celebrated of the old martyrologies is the *Hieronymian Martyrology,* erroneously attributed to St. Jerone. It is commonly believed to have been compiled in Italy in the 5th century, a recension of the manuscript being made in Gaul in the next century. The Roman Martyrology is read every day at dinner in all religious houses. The so-called "historical martyrologies," many of which still exist, as for instance the 8th-century manuscript of Bede, give a short history after the name of each saint mentioned in the calendar.

MARVELL, ANDREW (1621-78), English poet and statesman, was born at Winestead, in Holderness, Yorkshire, Mar. 31, 1621. He was educated at Cambridge, traveled on the Continent for several years, returned about 1650, and became tutor to Mary, daughter of Lord Fairfax. Later he was assistant to JOHN MILTON in his Latin secretaryship of state and went as secretary with Lord Howard on his missions to Russia, Denmark and Sweden. The high regard in which his integrity, practical gifts and talents caused him to be held is shown by the fact that he represented Hull in Parliament from 1659 until his death. Charles II tried in vain to win him to the court party. Marvell's satires had great influence in their day; his best lyrics and his *Horatian Ode* to Cromwell give him high rank as a poet. Among his loveliest poems are *The Garden, A Drop of Dew* and *Young Love.* He died at London, Aug. 18, 1678.

MARVEL-OF-PERU, a rapidly growing annual of the FOUR-O'CLOCK family widely planted in gardens for its showy flowers which open late in the afternoon.

MARVIN, CLOYD HECK (1889-), American educator, was born at Findlay, O., Aug. 22, 1889. He took degrees from the University of Southern California, 1915 and 1916, and from Harvard, 1917 and 1919. After spending three years as a member of the faculty of the Commerce Department of the University of California, Southern branch, in 1922 he became president and professor of economics at the University of Arizona. In 1927 he was elected president of George Washington University.

MARWAR, a city and native state in the Rajputana agency, India, better known as JODHPUR.

MARX, KARL (1818-83), German socialist philosopher and founder of scientific socialism, was born at Treves, the Rhineland, May 5, 1818, of Jewish parentage. When he was six years of age the family adopted Christianity. At 17 Marx entered Bonn and the following year transferred to Berlin. At these universities he studied law, philosophy, history and art. Finally at Jena he received the doctorate in 1841. A zealous student, he had originally planned for an academic career, but his radical ideas were not acceptable to this profession. Consequently he turned to journalism and in 1842 became editor of the *Rheinische Zeitung,* a short-lived radical paper that was suppressed the following year. Then began another venture with the *Franco-Prussian Year Books,* even more disastrous, only one number being issued. A frequent contributor to the *Vorwaerts,* Marx was finally forced to leave Paris and retired to Brussels. In 1847, with his friend Engels, he was appointed by the League of Communists to draw up a statement of its principles. This resulted in the celebrated *Communist Manifesto* which has become the watchword of the socialist movement. In its ringing words, "Ye workers of the world, unite. You have nothing to lose but your chains and you have a world to gain," it became the rallying banner of the oppressed classes. In 1849 Marx settled in London and here he remained for the rest of his life. His *Critique of Political Economy,* 1859, was written under great hardship, but out of it grew his great work *Capital,* the first volume of which was published in 1867. In 1864 Marx was inaugurated as president of the International Working Men's Association, the First International, which continued in existence for 10 years. Typical Marxian teachings are the economic interpretation of history, the labor theory of value, the doctrine of surplus value, and the theory of the class struggle. Marx died in London, Mar. 14, 1883.

In his life-long campaign in the cause of the working classes, Marx maintained that property and wealth gradually come into the hands of a privileged few, represented as Capital, who add to their possessions by exploiting the workers, or Labor. Labor is consequently driven downward and Capital elevated to an exalted position. But the conditions of the proletariat's existence tend to make him aware of inequality so that eventually he will organize into a strong body with others of his class. Then, with the rising power of Labor as opposed to Capital, will come the abolition of property distinctions and the common ownership of all products and instruments of production. In this Marx laid one of the foundation stones of modern communism. *See also* SOCIALISM; COMMUNISM; LABOR.

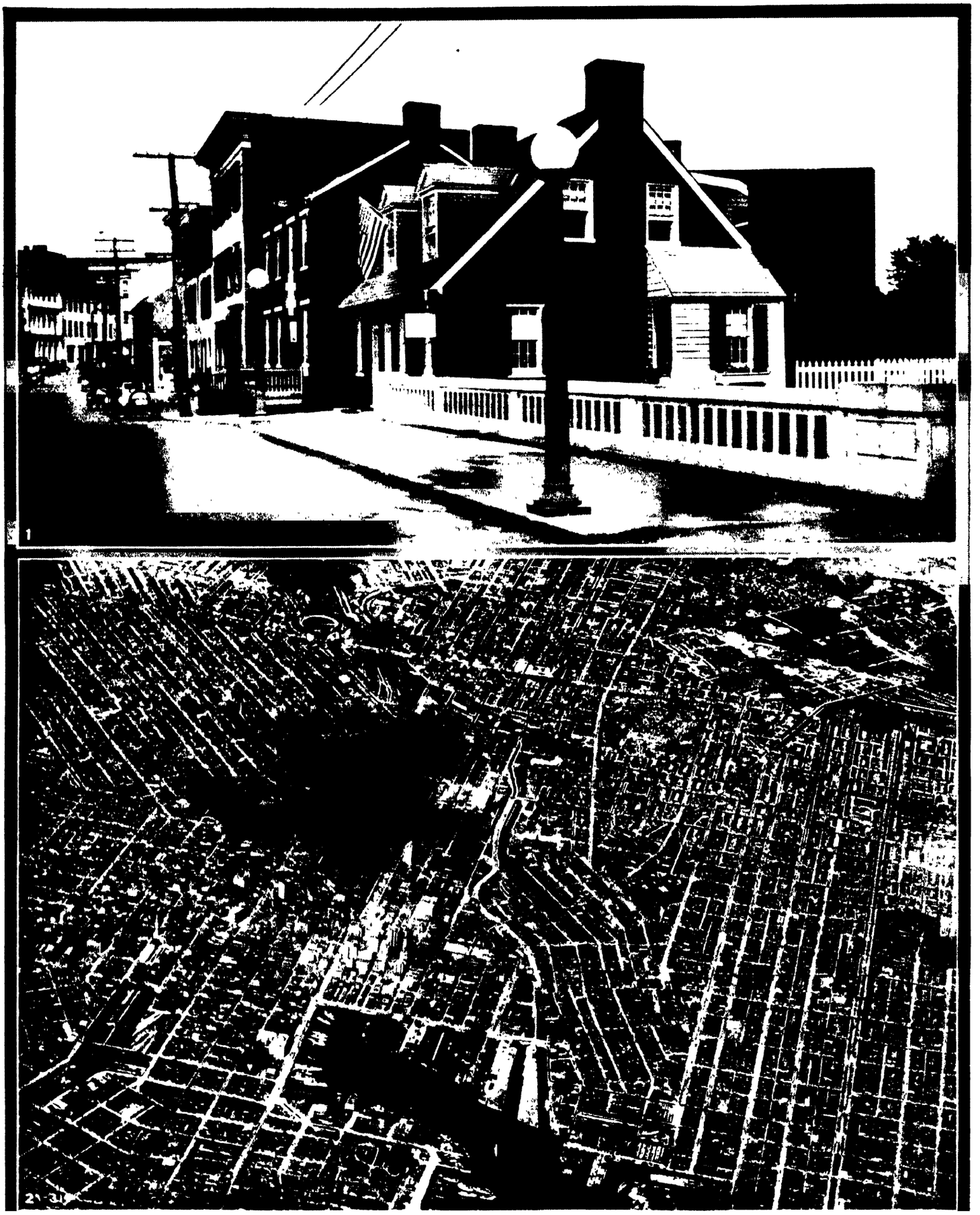
MARY, VIRGIN, mother of Jesus. According to the New Testament, she was a maiden of Nazareth, betrothed to Joseph (Matthew 1). In a scene known as the Annunciation, the Angel Gabriel told her that she would conceive a son and, realizing her privilege, she visited her cousins Zacharias and Elizabeth who were anticipating the birth of John the Baptist. At their home Mary sang her great song of praise, the MAGNIFICAT (Luke 1). Deeply disturbed, Joseph was advised in a dream to accept Mary as his legal wife and, proceeding to Bethlehem for enrollment in the Roman census (Luke 2) Mary was delivered of her child. After fleeing into Egypt from Herod (Matthew 2), she returned with Joseph to Nazareth where Jesus was brought up, and, according to Protestant



1, 3, COURTESY FREDERICK CHAMBER OF COMMERCE: 2, 4, EXTENSION DEPT., UNIVERSITY OF MARYLAND

SHRINES OF HISTORIC MARYLAND

1. Frederick County Courthouse, where the British Stamp Act was first repudiated in 1765. **2.** Monument at St. Mary's, marking the site of the meeting of first colonists of Maryland. **3.** Grave and monument of Francis Scott Key, author of "The Star-Spangled Banner," at Frederick. **4.** Middleham Chapel, built in 1748, in Calvert County.



1, COURTESY FREDERICK CHAMBER OF COMMERCE; 2, U. S. ARMY AIR CORPS

THE PAST AND PRESENT IN MARYLAND

1. A famous landmark in Frederick, the reconstructed home of Barbara Frietchie, heroine of Whittier's patriotic poem.
2. Air view of Baltimore, the chief city of Maryland.

MARYLAND

Area, 12,327 sq.m.
Pop. 1,631,526

PRINCIPAL CITIES

Pop.—Thousands

13 Annapolis. I 15
805 Baltimore F 14
2 Bel Air. . . . C 16
2 Berlin. . . . O 24
2 Brentwood . I 11
4 Brunswick. . F 7
9 Cambridge L 18
2 Capitol Heights J 12
3 Chestertown G 18
2 Cockeysville D 13
4 Crisfield. . . R 20
38 Cumberland L 6
2 Denton . . . I 20
4 Easton . . . J 18
3 Elkton . . . C 19
14 Frederick. . E 8
6 Frostburg. M 5
1 Grasonville I 17
31 Hagerstown B 6
4 Havre de Grace C 18
4 Hyattsville I 12
1 Indianhead M 10
1 Kensington H 10
3 Laurel . . . H 12
3 Lawsonia. R 20
1 Linthicum G 14
2 Lonaconing M 5
1 Luke. . . . N 4
4 Mt. Ranier I 11
4 Mt. Savage L 5
1 North East C 19
2 Oakland . . O 1
1 Ocean City N 25
2 Orangeville F 14
3 Pocomoke Q 22
1 Port Deposit . C 18
2 Riverdale. I 12
1 Rockville. H 10
1 St. Michaels K 17
11 Salisbury. N 22
1 Savage. . G 12
2 Snow Hill P 23
6 Takoma Park I 11
1 Texas. . . . D 14
1 Thurmont . C 7
3 Western Port N 5
4 Westminister C 12
2 Williamsport C 5

Pop.—Hundreds

9 Boonsboro. D 6
9 Midland . . M 5
9 Oxford. . . K 17
9 Taneytown B 10
9 Union Bridge C 10

DELAWARE

Area 2,370 sq. m.
Pop. 238,380

PRINCIPAL CITIES

Pop.—Thousands

2 Delmar, Md. and Del. M 22
5 Dover. . . G 22
2 Harrington I 22
2 Laurel . . . L 22
2 Lewes . . . J 25
4 Milford. . . I 23
4 Newark . . B 20
4 New Castle B 21
2 Richardson Park . . . B 22
2 Seaford . . L 21
2 Smyrna. . . F 21
107 Wilmington B 22

DIST. OF COLUMBIA

Area. . . 70 sq. m.
Pop. 486,869

CITY

Pop.—Thousands

487 Washington J 11

RAND McNALLY
POPULAR MAP OF
MARYLAND AND DELAWARE

SCALE 1:976,000
1 Inch = 15.4 Statute Miles
1 Centimeter = 9.8 Kilometers

Statute Miles 10 0 10 20
Kilometers 10 0 10 20 30

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interpretation, other children were born (Matthew 12:46). Mary accompanied Jesus on his visit to Jerusalem as a boy of twelve (Luke 2:41-52), and was present at the marriage in Cana where water was turned into wine (John 2:1-11). She stood at the cross (John 19:25-27) and was taken by the Apostle John to his home. Mary was among the disciples who, after the resurrection, gathered in an upper room (Acts 1:14).



COURTESY METROPOLITAN MUSEUM OF ART

THE VIRGIN ADORING THE INFANT CHRIST
15th century engraving in the style of Andrea Mantegna (1431-1506)

The record of Scripture has been supplemented by Catholic tradition. In 451, the Council of Chalcedon declared as a doctrine the perpetual virginity of Mary. According to this belief, the brethren of Jesus must have been sons of Joseph by a former marriage or, as Jerome insisted, the sons of another Mary, wife of Clopas or Alphaeus (John 19:25). The Catholic faith asserts that Mary was sinless (*see* IMMACULATE CONCEPTION). There is a further tradition that, at the death of Mary, her body was received into heaven and restored to the soul. This belief is not obligatory for Catholics, but the Feast of the Assumption of the Blessed Virgin is celebrated on Aug. 15. In their devotions, Catholics frequently invoke the intercession of the Blessed Virgin.

MARY I or "Bloody Mary" (1516-58), Queen of England, was born at Greenwich on Feb. 18, 1516, the daughter of HENRY VIII and his first wife, Catherine of Aragon. She was a very precocious child, receiving a thorough education through her mother and Catherine's Spanish advisors. At a very early age she was promised in marriage first to the French Dauphin and later to Charles V; by the treaty of 1527 she was promised in marriage to Francis I or to the Duke of Orleans, his second son. From that year until 1536 she went through a period of great misery, the result of Henry's attempt to divorce Catherine and to make valid his marriage to ANNE BOLEYN. When Elizabeth was born, Mary became a lady-in-waiting to the little princess, and fell under the hatred of Anne Boleyn. She was not allowed to bid her mother farewell when Catherine died in 1536. With the execution of Anne, Mary returned to some favor, but not without denouncing the Papacy and proclaiming herself a bastard. Although kindly treated by Edward VI, she lived in constant danger during her brother's reign. In 1553, when Mary should have succeeded, the Duke of Northumberland placed LADY JANE GREY on the throne, and she ruled for nine days. Mary, supported by the people and the law of succession, was acclaimed in London, and Lady Jane was executed. As Mary was a firm adherent to the Roman Catholic faith, her reign saw the restoration of the authority of the Papacy in England, in which cause she was aided by Philip of Spain, the prince-consort. The five years of her reign were marked as a period of severe persecution of the Protestants, nearly 300 persons, including Cranmer, Ridley, and Latimer, being burned or executed. Hence, she became known as "Bloody Mary." In the war with France in 1557 England lost Calais, her last foothold on the Continent. Mary died on Nov. 17, 1558.

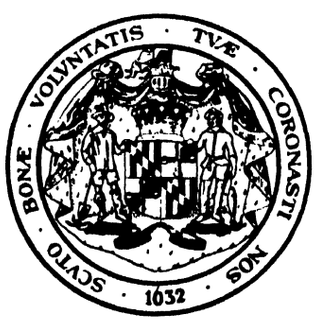
MARY II (1662-94), Queen of England, was born in London, Apr. 30, 1662, the daughter of James II and his first wife, Anne Hyde, daughter of the Earl of Clarendon. Mary was thus elder sister of Queen Anne. In 1677, she was married at the age of 15 to her cousin, William of Orange. When in 1688, James II fled to France, the throne was occupied jointly by William and Mary. The Queen died childless, Dec. 28, 1694, leaving William to reign alone.

MARY QUEEN OF SCOTS, or **MARY STUART** (1542-87), Queen of Scotland, was born at Linlithgow, Scotland, Dec. 8, 1542, only issue of James V of Scotland and Mary of Guise. Upon the death of her father eight days after her birth, the infant was proclaimed queen. Immediately negotiations were opened by the regent Earl of Arran to pledge her to Edward (later Edward VI), heir of Henry VIII of England. The Scots suspecting this move as an English plot to subjoin Scotland repudiated the treaty, to which Henry responded by invading the country. Mary was sent to an island for safety, and the betrothal treaty was never fulfilled. Overtures were then made to France, resulting in an agreement for her marriage to the dauphin, Francis. She set sail for France in 1548, and was educated in Paris by the Guises. In 1558 Mary was married to Francis. The following year he was crowned King of France. His death in 1560 ended Mary's ambitious projects to rule two kingdoms.

In 1561 she returned to govern Scotland. The task was extremely difficult. In JOHN KNOX the uncompromising leader of the Protestants she had a stern

critic. The turbulent nobility with her unscrupulous half-brother Murray at their head were haughty and rebellious. She found no wise or loyal advisers, and, what is more important still, she was a comparative stranger in her own country because of her education and long sojourn in France. A Catholic by birth and upbringing, she was out of sympathy with Presbyterianism. English intrigues further complicated her position, for ELIZABETH was both jealous and afraid of Mary who might some day ally herself with a strong foreign monarch and challenge Elizabeth's right to the throne. But Mary was too self-indulgent to play such a rôle. Infatuated with her cousin Lord Darnley, a Catholic, she married him in 1565, giving serious offense to the Protestants. She soon tired of his arrogance and presumptions and when he took part in a conspiracy to assassinate her chief adviser and friend, Rizzio, in 1566, she turned against him. The same year Mary gave birth to a son—later James I of England. The following year Lord Darnley was killed in a mysterious explosion at Kirk-of-Field. The chief conspirator was James Hepburn, Earl of Bothwell, who had the confidence of the Queen. When, therefore, Mary married Bothwell, three months after her husband's murder, suspicion at once associated her with the crime. This and the shocking character of the conspiracy aroused strong antagonism against her among the nobles. The Lords took up arms against her, defeated her, compelled her to abdicate in 1567 and imprisoned her in the island castle of Lochleven. The following year she escaped from prison, but was recaptured. Escaping a second time, she threw herself in desperation upon the clemency of Queen Elizabeth by whom she was imprisoned in Fotheringay Castle. Embarrassed by the presence of her rival, Elizabeth was greatly perplexed over what to do with her royal prisoner. Out of this dilemma she was extricated by Mary's participation in a plot against Elizabeth—the BABINGTON PLOT—the evidence was none too convincing but the court found her guilty and she was executed at Fotheringay Castle in Feb. 8, 1587, the year before the Armada. W. E. LI.

MARYLAND, a middle Atlantic state, one of the thirteen original states of the United States, popularly called the "Old Line State." It is situated between 37° 53′ and 39° 44′ N. lat. and 75° 4′ and 79° 33′ W. long. On the north it is bounded by Pennsylvania, on the east by Delaware and the Atlantic Ocean, and on the south and west by West Virginia and Virginia, from which it is separated in part by the Potomac River. Maryland comprises an area of 12,327 sq. mi., inclusive of 2,386 sq. mi. of water surface, with an extreme length of 240 mi. from east to west and an extreme breadth of 128 mi. from north to south. The outline of the state is very irregular. Maryland ranks forty-first in size among the states of the Union.



MARYLAND STATE SEAL

Surface Features. The topography of Maryland is varied, being low and flat toward the ocean and rising to mountain heights in the western section. All of that part east of Chesapeake Bay and a narrow strip west of that body lie within the Coastal Plain. In the part of the state east of Havre de Grace, Baltimore and Washington granitic rocks rise to the surface and west of this portion is the undulating Piedmont Plateau which terminates in Frederick County with the Catoctin Range of the Blue Ridge Mountains. Paralleling the latter on the west are, successively, the Shenandoah Valley which is a part of the Great Appalachian Valley, a series of valley ridges and the Allegheny Plateau from which rise the Big Savage, Meadow and Backbone mountains. The latter, 3,340 ft. high, is the highest point in the state. The mean elevation above sea level is 350 ft.

Aside from its boundary streams and the SUSQUEHANNA RIVER which empties at the head of CHESAPEAKE BAY, Maryland has numerous small streams, chiefly the Patuxent in the mainland and the Chester, Chaptauk, Nanticoke and Pocomoke in the eastern peninsula.

Climate. Influenced in the extreme west by the altitude of the mountains and modified in the southeast by Chesapeake Bay and the Atlantic Ocean, Maryland exhibits both a fairly cold and a mild climate. The mean annual temperature is about 53° F., varying from an average of about 48° F. at Grantsville in the northwest to 57° F. at Princess Anne in the southeast. The average annual precipitation is about 43 in. and is greatest in the mountains. At Baltimore, the mean annual temperature is 55.4° F., ranging from an average of 33.8° F. for January to 77.2° F. for July, with an average annual precipitation of 42.6 in., including 23.8 in. of snow.

Forests and Parks. Maryland has a forested area of 2,223,000 acres or approximately one third the land area. There are 157 trees native to the state including white and yellow pine, spruce, cypress, cedar, hemlock, beech, birch, maple and the majority of the important timber trees of the eastern United States. Practically all of the original timbered area of 5,760,000 acres has been cut and re-cut. An active forestry department created in 1906 supervises fire protection, education of the public by lectures and general publicity, advises private owners in the management and disposal of their timber holdings and administers the state forests and nurseries. State owned forests covered 9,082 acres in 1929; they are open to the public for camping, hiking, bathing, fishing and other recreational uses. The Patapsco Forest, 10 mi. west of Baltimore, is the largest and best developed. An additional 6,986 acres are in auxiliary forests and other state properties. FORT MCHENRY NATIONAL MONUMENT and Antietam National Military Park are administered by the War Department.

Minerals and Mining. The chief mineral resources of Maryland are deposits of bituminous coal

found in Allegany and Garrett counties, beds of excellent clays for fire brick and pottery making, and quarries of fine building stone. With mineral productions in 1929 amounting to $18,469,568, Maryland stood thirty-second among the states. Among the principal items in this output were clay products valued at $5,115,816; coal, 2,649,114 tons, $4,640,000; sand and gravel, 3,193,486 tons, $3,780,937; limestone, $1,053,738; basalt, $599,034, and granite, $261,259. During 1929 130 mines and quarries gave employment to 4,978 persons who received $5,666,867 in salaries and wages.

Soil. In accordance with the great diversity of the underlying rocks, Maryland exhibits an exceptional variety of soils. On the Atlantic Coast light sands and loams prevail adapted to truck gardening and the raising of peaches. On the soils of the extreme south large quantities of tobacco are produced. A soil of fine texture, known as "gabbro," is found in the northeast. Western Maryland has heavier soils, mostly clays, because of the underlying limestone and shale formations. This section is especially adapted to the production of grains. On the western slope of the Blue Ridge Mountains, there is a shaly soil of high excellence for peach cultivation. The higher elevations of the Alleghenies are either bare or possess only a poor soil, but in the valleys there are areas of rich alluvium.

Agriculture. The leading crops are grain, vegetables, hay, tobacco and fruits.

In 1930 4,374,398 ac. or 68.8% of the entire land area was in farms, 43,203 in number, with an average size per farm of 101.3 ac. and an average value per acre of $81.42. Of the farm area 2,129,264 ac. was crop land; 958,822 ac., pasture land, and 1,007,629 ac., woodland. The total value of farm property was $425,247,757, of which $356,170,168 was represented by land and buildings; $25,682,263, by implements and machinery; and $43,395,326, by domestic animals.

According to the census of 1930 Maryland produced in 1929 field crops to the value of $65,764,431, ranking thirty-fifth among the states. It stood eleventh in tobacco, third in tomatoes and cantaloupes, fourth in beans and peas, and sixth in sweet corn and in strawberries. The chief crops were grain, $25,847,250; vegetables, $20,264,557; hay and forage, $8,200,113; tobacco, of which 21,624,127 lbs. were grown on 32,974 ac., $5,923,726, and fruits, $5,528,785. The grains included corn 14,543,218 bu., wheat 9,095,169 bu., and oats 1,164,583 bu. The chief vegetables were tomatoes $4,732,401, potatoes $4,074,000, sweet potatoes $1,466,706, sweet corn $1,405,825, beans $1,366,903, cantaloupes $856,947, spinach $724,641, and green peas $678,542. Of the hay crop of 473,940 tons timothy and clover furnished 386,445 tons or 74%. The fruits included apples 2,087,153 bu., peaches 654,669 bu., pears 112,861 bu., and strawberries 16,804,082 qts.

Farm products sold by cooperative marketing rose from $3,089,200 in 1919 to $6,924,827 in 1929, and farm supplies purchased by this method from $272,420 to $1,178,464. Farm machinery and equipment in 1930 included 37,972 automobiles, 11,284 motor trucks, 7,208 tractors, 3,669 electric motors, and 9,330 stationary gas engines.

Animal Industry. Milk, chicken eggs and poultry are the leading animal products. According to the census of 1930, Maryland ranked thirty-seventh among the states in total value, $43,395,326, of domestic animals on farms. Among these were cattle, 318,779 valued at $22,143,823; horses, 94,099, $9,512,011; mules, 29,051, $3,561,430; swine, 205,361, $2,515,360, and sheep, 194,152, $1,848,574.

Of the cows on farms, 190,416 were kept mainly for milk production and 7,118 mainly for beef production. In 1929, 87,785,709 gals. of milk were produced; the total value of dairy products marketed, mostly whole milk, was $18,715,877. The value of all poultry raised was $9,008,493. The number and value of the chief kinds were chickens, 7,422,461, $7,558,831; turkeys, 278,579, $1,122,656; ducks, 199,430, $218,919, and geese, 41,598, $108,087. The chickens sold, 3,563,273 in number, were valued at $3,773,843. Of 27,709,334 doz. chicken eggs produced, valued at $9,296,258, 22,401,915 doz., valued at $7,509,975, were marketed.

Fisheries. Maryland ranked tenth among the states in the value of its fisheries during 1930. The total catch amounted to 63,388,000 lbs. and was valued at $4,295,000. Oysters were the most valuable single catch, followed by shad, crabs, alewives, striped bass, menhaden, perch, catfish and sturgeon. The oyster take varies, but is usually from 40% to 50% of that of the whole country.

The propagation of shad in Maryland waters was the first successful work of the sort initiated by the United States Bureau of Fisheries and proved the value of artificial propagation of fish. At one time the run of shad up Atlantic Coast bays and rivers, especially Chesapeake Bay, was phenomenal. These waters were fished out when the Bureau of Fisheries started planting small shad, but the yearly take soon increased enormously. However, the shad fisheries of Chesapeake Bay and its tributaries are now declining, due to water pollution and other causes, and though state and Federal authorities are making every effort to counteract this, results are not encouraging. This is especially unfortunate, since shad have been driven from most of the Atlantic coast rivers which they once frequented in great numbers. Water pollution is also greatly injuring the oyster beds of the Bay.

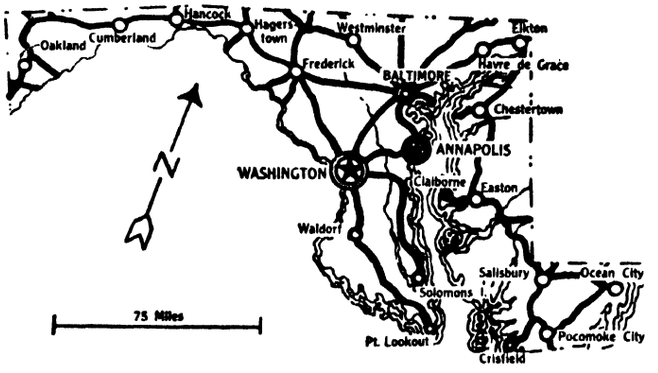
The state operates six fish hatcheries and in 1930 spent $40,395 for fish propagation. The output of these hatcheries included 200,645 trout, 57,860 bass and 841,999,600 commercial species. In the same year, 14,314 fishing licenses were issued, $16,525 being received in fees. Maryland is one of the few states spending more for fish propagation than it receives in fishing licenses, an indication of a far-sighted policy.

The United States Bureau of Fisheries cooperates

with the state and in 1930 planted the following in Maryland waters: 446,000 shad, 210,100 rainbow trout, 202,400 loch leven trout, and 96,850 brook trout.

Transportation. The Baltimore & Ohio, America's pioneer steam railroad, was chartered in 1827. The laying of its rails began on July 4, 1828. Its first section, 13 mi. long, from Baltimore to Ellicott's Mills, was opened in May, 1830. On Jan. 1, 1930, the Baltimore & Ohio, still one of the premier steam railway systems in the United States, controlled more of Maryland's total railway mileage of 1,439 than any other road. Other systems operating in the state are the Western Maryland, Philadelphia, Baltimore & Washington and the Baltimore, Chesapeake & Atlantic lines. Excellent water transportation facilities are provided by Chesapeake Bay, with its numerous inlets, deep channel and navigable tributaries. The Chesapeake & Delaware canal, which crosses the northern end of the Delaware-Maryland peninsula, and affords a short route for coastwise vessels from Philadelphia and Wilmington to Baltimore, is an important inland waterway. Steamship lines ply out of Baltimore harbor to all parts of the world.

On Jan. 1, 1930, the state's highway system showed a total mileage of 20,437, including 5,704 mi. of surfaced roads and 2,831 mi. of state highways. Highway expenditures during 1929 were $15,040,419, of which $10,979,790 was paid by the state and $4,060,629 by county and local governments. The state



MARYLAND STATE ROADS

gasoline tax produced a gross revenue of $6,991,188 in 1930 as against $2,293,854 in 1926. Motor vehicle registrations in 1930 were 321,702 compared with 234,247 in 1925. The rapid growth of transportation by truck is indicated by registrations, which increased from 12,074 in 1925 to 37,832 in 1930, over 200%. During the same period, the number of buses in operation increased from 529 to 1,389, or over 140%.

Manufactures. Manufacturing, which is the principal industry of the state, is centered almost wholly within the city and county of Baltimore, where 85% of the state's entire output is produced. Since 1900 growth in manufactures has been extensive, especially during and after the World War. Proximity to abundant supplies of coal and excellent transportation facilities by rail and water have been influential factors in this industrial expansion.

According to the Census of 1930 Maryland with manufactures for 1929 valued at $1,119,082,289 stood sixteenth among the states. Its 3,231 establishments gave employment to 19,807 officers and employees, who received $46,178,193 in salaries, and to 131,099 wage earners, who were paid $148,835,163 in wages. These factories used a total of 659,823 horse power, expended $38,521,776 for fuel and power, and $658,463,766 for material and supplies, and added by the process of manufacture $422,096,747 to the value of their output.

In this diversified output there are 112 groups of products specifically enumerated in the Census, comprising 62% of the total manufactures. For the remaining 38%, which includes large outputs of iron and steel and refined sugar, no official information for separate products is given. Among the manufactures separately reported the state stood second in fertilizers and men's furnishing goods, third in tin cans for canning, fifth in men's clothing, eighth in canning fruits and vegetables, and ninth in women's clothing and patent medicines.

Among the leading manufactures separately specified, with value of output, were meat packing, $46,215,184; men's clothing, $45,276,809; petroleum refining, $43,456,428; brass and bronze products, $38,507,719; tin cans, $38,402,438; printing and publishing, $30,483,594; canned fruits and vegetables, $30,283,185; foundry and machine shop products, $26,515,394; fertilizers, $25,506,620; and women's clothing, $16,685,638.

The manufactures of the Baltimore district amounted to about $951,000,000, of which the city contributed $816,000,000 and the county $135,000,000. Minor factory cities with their output were Cumberland, $37,949,536, and Hagerstown, $22,514,770.

Commerce. According to the census of 1930, there were in 1929, 2,205 wholesaling establishments in Maryland, with total sales of $741,655,913. These organizations gave full-time employment to 22,496 men and women, whose annual salaries aggregated ,132,323. The chief wholesaling center is Baltimore.

The total sales of the 21,129 retail stores amounted to $613,812,177. Sales per store averaged $29,051; sales per capita were $376.22.

CHIEF RETAIL DISTRIBUTING GROUPS

Group	*No. of Stores*	*Sales*	*% of Total*
Food	9,420	$168,242,618	27.38
General Mdse.	2,151	119,612,987	19.48
Automotive	2,357	97,480,591	15.87
Apparel	1,452	45,004,054	7.33
Lumber & Bldg.	808	42,501,715	6.93
Furn. & Household	454	27,645,788	4.52
All other stores	4,397	113,324,424	18.49
Total, all stores	21,039	$613,812,177	100.00

Baltimore, the principal port, handled water-borne traffic amounting to 20,264,165 tons, with a value of $787,725,740. Coal, oil, iron, sand and gasoline were the largest items.

Finance and Banking. The assessed value of all taxable property in 1929 was $2,891,095,003. The state's net funded debt was $26,985,718 in 1930. Maryland was one of the first states to adopt a budget system in 1916. Total revenues in 1929 were $35,024,729. The chief sources of income were property, corporation, motor vehicle, gasoline and inheritance taxes and a tax on the gross income of corporations. Total expenditures were $31,141,132, with highway expenditures, debt service and educational aid the principal items.

There were 225 banks in Maryland in 1930. Of these, 73 were national banks, 148 trust companies and state banks and 4 private banks. Their total capital was $40,973,800; their surplus and undivided profits, $87,347,000. Total resources were $1,003,781,000, with loans and discounts aggregating $495,550,000. Demand and time deposits totaled $790,963,000. Per capita demand and time deposits were $483.77; per capita savings deposits, $297.56. The total savings of $486,512,000 were owned by 1,007,013 depositors. National bank circulation aggregated $6,887,000.

Government. The law-making power of the state is vested in a legislature consisting of a senate composed of 29 members and a house of representatives of 118 members, all elected for terms of four years and meeting in biennial sessions limited in duration to 90 days. The chief executive officer is the governor, elected for a term of four years at a salary of $4,500. He has the power of veto, but a three-fifths majority of both houses overrides his veto. Judicial power is vested in a court of appeals, circuit courts, orphans' courts and eight judges elected by districts for terms of 15 years at salaries of $6,800.

Social Welfare Institutions. A state training school is maintained at Owings Mills, one for boys only at Loch Raven, a school for the blind at Overlea, training schools for the deaf at Frederick and at Irvington and an industrial home for colored girls at Melvale. Tuberculosis hospitals are located at State Sanitarium, Salisbury and Mt. Wilson, and one for colored persons at Henryton. Springfield State Hospital for the Insane is at Sykesville, Eastern Shore Hospital at Cambridge, Spring Grove Hospital at Catonsville and a hospital for Negroes at Crownsville. At Jessups is a house of correction and at Cheltenham a house of reformation for colored boys. The penitentiary is in Baltimore.

Education. The first school in the state was taught by Ralf Crouch who crossed from Virginia to Maryland and taught there from 1639 to 1659. Charles Peale conducted the Kent County School at Chestertown before 1745, and James Hunt taught at Bladensburg in 1773. An act passed in 1796 authorized the erection of free schools in each county. By 1929 there were 1,845 elementary and junior high schools, having 236,804 pupils and 6,829 teachers and 179 public high schools with 37,896 pupils and 1,615 teachers. Children between 7 and 13 years of age are required to attend school the full term.

The number of persons, 5 to 20 years of age, attending school in 1930 was 322,141, or 65.7% of the population within the ages specified, as compared with 266,529, or 60.5%, in 1920. Persons 10 years and over unable to read and write in 1930 numbered 49,910, or 3.8%, as compared with 64,434, or 5.6%, ten years ago. Illiteracy among the Negro population 10 years and over was reduced from 35,404, or 18.2% in 1920, to 25,073, or 11.4%, in 1930. Illiterate native whites numbered 13,202, or 1.3%, in 1930, as compared with 15,368, or 1.8%, in 1920.

Among the institutions of higher learning, the state controls the University of Maryland at College Park and four normal schools. Important private educational institutions include the Johns Hopkins University at Baltimore, St. John's College at Annapolis, Goucher College at Baltimore, Washington College at Chestertown, Hood College at Frederick, and, for Negroes, Morgan College at Baltimore. The United States Naval Academy is located at Annapolis. The Maryland Public Library Advisory Commission has its headquarters in Baltimore.

Population. In 1930 Maryland ranked twenty-eighth among the states with a population of 1,631,526 or an average of 164.1 per sq. mi., an increase of 181,865 or 12% over 1920. The population rose from 319,728 in 1790 to 687,049 in 1860, 1,188,044 in 1900, 1,295,346 in 1910 and to 1,449,661 in 1920. In 1930 there were 1,354,170 or 83.0% whites, and 276,379 or 16.9% Negroes, an increase from 1920 of 12.4% whites and 13% Negroes. Of the whites, 1,259,077 were native born and 95,093 were foreign born. The urban population was 974,869 or 59.8% of the total, an increase of 105,447 or 12.1% from 1920; the rural population was 656,657 or 40.2% of the total, an increase of 76,418 or 13.2% since 1920. In 1930 the five largest cities were: Baltimore, 804,874; Cumberland, 37,747; Hagerstown, 30,861; Frederick, 14,434; Annapolis, the capital, 12,531.

Occupations. In 1930 672,879 persons, or 41.2% of the population, were gainful workers 10 years old or older; 76.6% of these were males and 23.4% were females; 72% were native white; 7.7% foreign-born white, and 20.2% Negro. In manufacturing, the principal occupation, 223,412 persons were engaged; of these 64,740 were factory operatives, 31,497 factory laborers, 18,447 general building laborers, and 15,774 carpenters. Among other important occupations, with number of workers, were trade, 87,452, including 25,083 retail dealers and 29,709 salespersons; agriculture, 84,082; domestic and personal service, 80,887; clerical occupations, 61,075; transportation and communication, 61,068, including 15,474 chauffeurs; professional service, 43,963, including 11,400 school teachers, and public service, 1

HISTORY

CAPT. JOHN SMITH, voyaging from Jamestown in 1608, found Indians of Algonquin stock along Chesapeake Bay. Virginian colonists developed trade in furs and maize with these Indians. William Claiborne, on Aug. 17, 1631, established a trading post

on Kent Island. George Calvert, first Lord Baltimore, of a Catholic family, received from Charles I in 1632 sole proprietorship of the region now forming the states of Maryland and Delaware. Calvert's brother Leonard sailed as governor with 200 colonists, landing on St. Clement's, now Blackiston's Island on Mar. 25, 1634; on the site of an Indian village St. Mary's was founded. Religious toleration of sects of trinitarian Christianity existed in Maryland from the first. The proprietor in 1638 surrendered his claim to the sole right of initiating legislation; a bicameral legislature was soon functioning, carrying the processes of democracy farther than the proprietor had intended. By 1654 the Puritan element in the colony outweighed the Catholic; Lord Baltimore was dispossessed, and the famous Toleration Act of 1649 was repealed. Proprietary government was restored in 1658; from 1692 until 1715 a royal government was set up, to be abandoned when the fifth Lord Baltimore, a Protestant, inherited the proprietorship.

Tobacco, the colony's staple product, usually commanded a profitable market; game and fish were abundant; and Maryland was fairly prosperous as the 18th century began. After the Anglican church was established in 1692, Catholics were disfranchised. The boundary line between Maryland and Pennsylvania was for many decades a subject of litigation (*see* Mason and Dixon Line). After 1715 many disputes arose between the proprietor and the lower branch of the legislature over the extension of English statutes to Maryland and other issues affecting proprietary authority. Popular clamor was directed against the British Parliament after 1763. The distributor appointed under the terms of the Stamp Act was driven from the colony; in 1774 a tea ship was burned. Yet the Maryland delegates to the Continental Congress were among the last to vote for independence, and the state constitution adopted in 1776 was of an aristocratic nature. The first state legislature met at Annapolis, Feb. 5, 1777. The 13th state to enter the Confederation, having delayed until the states with western lands promised to cede their claims to the nation, Maryland found its interest in the commerce of the Chesapeake not safeguarded by the Confederation; this situation led directly to the framing of the federal Constitution. The present District of Columbia was ceded to the new government by Maryland in 1791. In 1810 property qualifications for suffrage and office were abolished; in 1837 the election of the governor was vested in the people. New constitutions were adopted in 1851, establishing representation by population; in 1864, abolishing slavery, and in 1867. Maryland suffered considerably in the War of 1812, and was the scene of riots in the early months of the Civil War until Union control was assured. The Democratic party controlled the state from 1866 to 1895, and since 1900 has usually been in power; but in 1928 the electoral votes of Maryland were given to the Republican Presidential candidate. In 1930 a dispute, pending since 1861, concerning the Maryland-Virginia boundary along the bed of the lower Potomac, was adjusted. Albert C. Ritchie, Democrat, was reelected governor in 1931. In the next year the state voted for Roosevelt, and elected Millard E. Tydings, Democrat, to the Senate.

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MARYLAND, UNIVERSITY OF, at College Park, Md., a coeducational institution, had its beginning in the College of Medicine of Maryland, founded in Baltimore in 1807. This institution became the University of Maryland in 1812. In 1930 the old University of Maryland was combined with the Maryland State College founded in 1858 as the Maryland Agricultural College, and the resultant institution incorporated as the University of Maryland. The departments of Agriculture, Arts and Sciences, Engineering, Home Economics, Education, and the Graduate and Summer schools are located at College Park. The schools of Medicine, Dentistry, Pharmacy, Nursing, Law and Business are at Baltimore. The productive funds in 1931 totaled $2,972,607. The library contained 62,000 volumes. In 1931-32 there were 3,192 students and a faculty of 567 headed by Pres. Raymond A. Pearson.

MARY MAGDALENE, or Mary of Magdala, described by St. Luke as a woman out of whom Jesus cast seven devils. She came from Magdala, a town on the shores of Galilee, the modern El Mejdel. She became closely associated with Jesus, was present at his crucifixion, prepared spices for his sepulcher and was the first to see him after the resurrection, a fact which some scholars believe makes her the sole voucher for his return to life. She has been commonly identified with the woman who was "a sinner," mentioned by St. Luke (7:37-50), and also, with less reason, with Mary of Bethany, the sister of Martha and Lazarus. Throughout the Christian ages she has been memorialized in art. Mary Magdalene has been canonized by the Catholic Church.

MARYSVILLE, a city in northern California, the county seat of Yuba Co., situated on the Yuba River, near its meeting place with the Feather River, and adjoining Yuba City, 47 mi. north of Sacramento. Bus and truck lines and the Southern Pacific, Western Pacific and Sacramento Northern, an electric interurban, serve the city. Marysville is a trade center for a stock-raising, grain and fruit-growing region. The principal crops are peaches, pears, prunes and grapes. There are fruit drying plants and canneries.

The city was established as a trading post in 1842, on land which was originally a grant. Marysville is one of the oldest mining towns in California; the trails of '49 run into Yuba County. Many of the houses are built of bricks which journeyed around "the Horn" as ballast. The city was incorporated in 1850. Pop. 1920, 5,461; 1930, 5,763.

MARYVILLE, a city in northwestern Missouri, the county seat of Nodaway Co., situated on the One-Hundred-and-Two River, 42 mi. north of St. Joseph. Bus lines and two railroads afford transportation.

Maryville is a commercial and shipping center for the live stock of the region. The chief industry is meat-packing. The city is the seat of the Northwest Missouri State Teachers College. Maryville was founded in 1841; incorporated in 1856. Pop. 1920,

MASARYK, THOMAS GARRIGUE (1850-), first president of Czechoslovakia, was born at Hodonin, Czechoslovakia, on Mar. 7, 1850. He was the son of a coachman on one of the estates of the Emperor of Austria. In his youth Masaryk worked as a blacksmith, but studied for the teaching profession with such success that in 1879 he was lecturing on philosophy in Vienna. During the next decade he became intensely interested in politics and in 1907 was elected to parliament in Vienna. He had incurred the displeasure of the Austrian official circles before the outbreak of the World War, and in December 1914, he fled from Austria. During a sojourn in Switzerland, France, England, Italy, Russia and the United States, he carried on a vigorous propaganda for Czechoslovak independence. He was a close personal friend of President Wilson and was successful in obtaining official sympathy for his projects in the Lansing Declaration. On Nov. 14, 1918, the popularly elected National Assembly proclaimed Czechoslovakia a state with Masaryk as president. After two years he was formally elected for seven years and in 1927 for a second term of seven years.

MASCAGNI, PIETRO (1863-), Italian music composer, was born at Leghorn, Dec. 7, 1863, the son of a baker. After studying music at Milan, he was for several years conductor of traveling opera troupes in Italy. He settled at Cerignola as director of the Municipal Music School. In 1890 his *Cavalleria Rusticana* won first prize in a competition sponsored by Sonzogno, the music-publisher, for a one-act opera. The opera created a furor, unequalled by the composer's succeeding operas which include *L'Amico Fritz, I Rantzau, Zanetto, Iris, Il Piccolo Marat,* produced in Rome in 1921, and *Isabeau.*

MASCARA. *See* FACE PREPARATIONS.

MASCARENE ISLANDS, a collective name given to the islands of MAURITIUS, Rodriguez and RÉUNION in the Indian Ocean, about 400 mi. east of Madagascar. They are named after Mascarenhas, a Portuguese navigator who discovered Réunion in 1454. Mauritius and Rodriguez belong to Great Britain and Réunion to France.

MASEFIELD, JOHN (1878-), English poet, novelist and dramatist, was born in Ledbury, Herefordshire, June 1, 1878. His youth was spent in roaming widely by land and sea, and for a time Masefield worked at odd jobs, in New York City. Returning to England he began in 1902 to write and publish poems, and after that date books of verse, fiction and drama flowed rapidly from his pen. His first volume of poems was the well-known *Salt Water Ballads,* 1902. Masefield is best known by his long narrative poems, which are realistic, vivid, austere in spirit. Among them are *The Everlasting Mercy, The Widow in the Bye Street, Dauber, The Daffodil Fields* and *Reynard the Fox.* His plays include *The Tragedy of Nan* and *The Trial of Jesus.* Numbered among his novels are *Sard Harker,* 1924, and *Odtaa,* 1926. Masefield was appointed Poet Laureate in 1930. His *Chaucer,* a lecture, appeared in 1931, and *A Tale of Troy,* a book of poems, in 1932.

MASERU, capital of BASUTOLAND in British South Africa, is situated near the Caledon River and connected by rail with the South African system. The town contains a government industrial school for natives, a hospital and several churches. The principal articles of trade are wool, wheat and corn. Pop. 1921, 2,300, of which 400 were Europeans.

MASK (French *masque,* German *maske,* Italian *maschera,* Spanish *mascara,* Polish *maska*), in the widest sense, an artificial cover for the face with breathing apertures and openings for the eyes.

Masks are used for disguise or to protect the face. The art of making and using masks for the purpose of disguise is very ancient. From times immemorial people in different parts of the world used masks which simulated the faces of supernatural beings, men or animals.

The primitive people used them, as they are using them now, in their religious ceremonies, in invocations of spirits, propitiation of demons or elements, to inspire terror or cure maladies; to them the mask was always a thing of mystery endowed with supernatural power, or magic properties, holy, awe-inspiring, terrifying or benevolent, a thing that should not be used frivolously. To-day the mask has the same deep significance among the primitive tribes of Africa and Asia, among the savages of Oceania and Australia and among the Indians of America.

The American Indian medicine men disguise themselves with demoniacal masks to frighten away diseases or evil spirits. They put on animal masks, heads of deer or bison, and go through a dance simulating the behavior of these animals to secure success in a hunt. In dry season they wear masks in their incantations in order to bring rain.

Their masks are usually grotesque creations carved in wood and painted, sometimes adorned with hair, fur or feathers. The best mask makers among the American Indians are those of British Columbia (Kwakiutl), and Alaska.

Many tribes of African Negroes use masks in their initiation ceremonies and the members of the African secret societies hide their identity behind grotesque masks; and so disguised they terrify their tribesmen and coerce them into absolute obedience. Of all parts of Africa the most noteworthy for their interesting masks are Nigeria, Camerun, Congo, Slave Coast, Liberia and Ivory Coast. Most of the African masks are of carved wood.

Among the people of Oceania the Melanesians are the most ingenious creators of terrifying masks. The Papuans and the natives of New Hebrides, New Britain and New Ireland cover their faces with symbolic, extravagantly grotesque creations constructed of

wood, grasses and bones. The masked duk-duk dancers of New Guinea are the best example of the effect of such disguise.

Among the people who long since emerged from the primitive savagery into the state of barbarism, the mystery, the importance and the prestige of the mask lose much of their power. The mask is still used in religious ceremonies or in connection with witchcraft, but as it is not any more believed to be something holy or endowed with supernatural power, it can be used for entertainment and amusement. Thus the lamas of Tibet at their temples and monasteries perform and dance in grotesque masks representing various categories of demons. Their performances are religious, and they are intended to impress the spectators with the power of the demons whom they represent, but the great mystery is not there, instead there is an element of histrionic art that tends toward entertainment. The Tibetan masks, which are made of woodpulp and are lacquered, represent various demons, some looking like bulls, others having antlers. In Java, Cambodia, Siam and Burma the masked dances combine religious meaning with entertaining qualities.

The more sophisticated are the people, the less abstruse significance do they attach to masks. With them the mask is a beautiful work of art that can be used in connection with other art, the drama, for example.

The *No* dances or dramas of Japan are dramatizations of ancient Buddhistic religious legends, and are performed by actors wearing masks. The *No* masks are works of sophisticated art. They are exquisitely carved in wood and painted. They are shallow, covering only the face but not the sides of the head; this makes them differ from the *gigaku* masks of earlier origin which cover the whole head.

In antiquity the Greeks and the Romans used masks in their tragedies and comedies. As the distance from the stage to the spectators was considerable in the open air amphitheaters, it was necessary to enhance the stature and the voice of the actor, therefore the Greek mask was large with exaggeratedly pronounced features and intensified expressions; it was used in conjunction with the *coturnae,* or stilts and long robes. There was a funnel leading from the actor's mouth to the wide open mouth of the mask. In the Middle Ages masks were used in Mystery Plays, but later the use of masks on the stage was abandoned and forgotten in Europe. It is only now in this last decade that the first attempts have been made to revive the use of masks in the theater, in drama, dance and pantomime, and it is in pantomime where masks find the best application.

W. T. B.

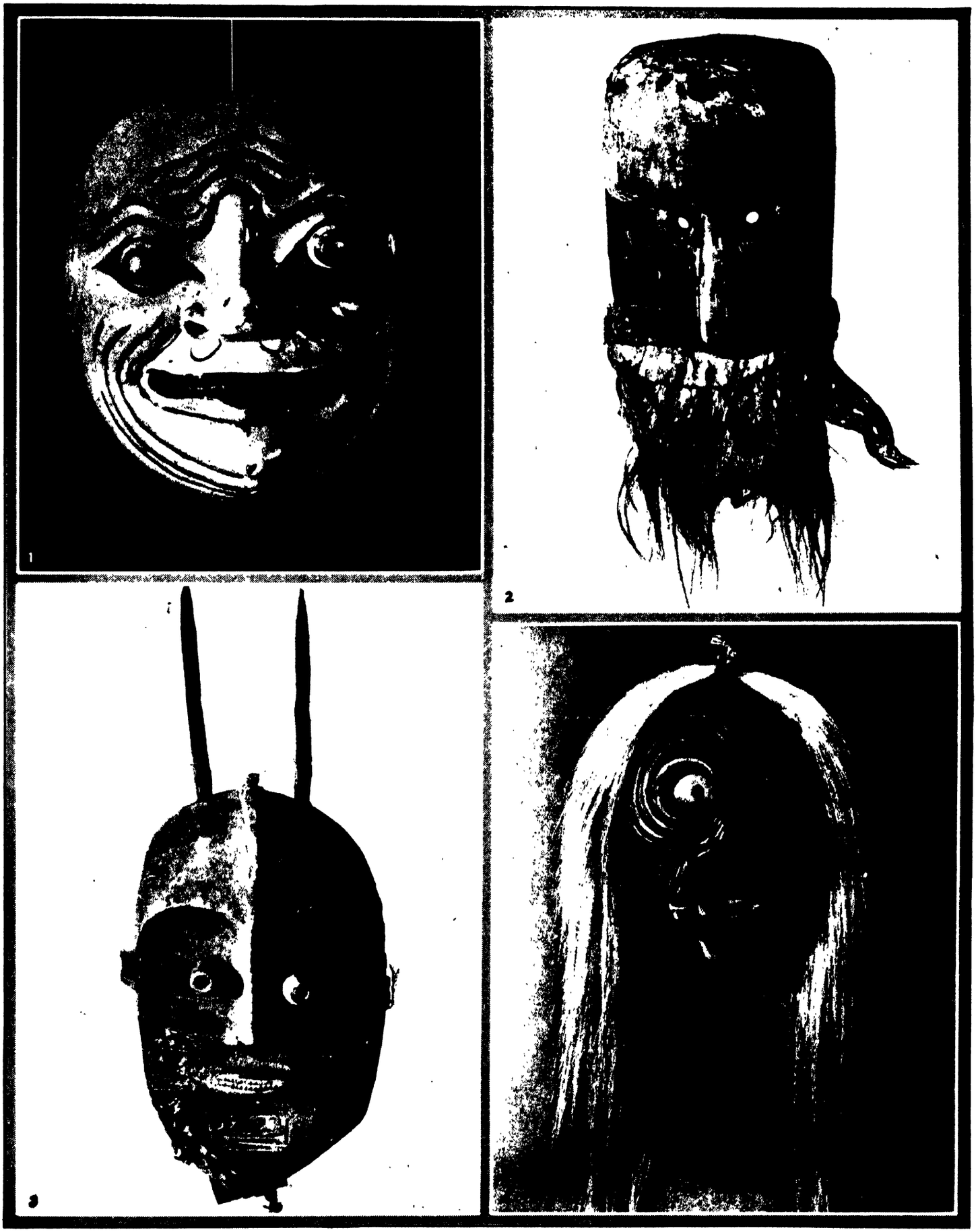
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MASON, GEORGE (1725-92), American colonial statesman, was born in Fairfax Co., Va., in 1725, of a prominent family, and early in life became an influence in political affairs. He was leader of the opposition in Virginia to the Stamp Act; helped, in 1776, to frame the Virginia Constitution and was author of its Bill of Rights. In 1787 he was a member of the convention at Philadelphia which framed the Federal Constitution, finally refusing to sign the document. He stoutly opposed many features of the proposed government, including that clause which would prevent national interference with the slave trade until 1808. In the Virginia Convention of 1788 for ratifying the Constitution, he and Patrick Henry were the leaders of the anti-Federalists who unsuccessfully opposed its adoption. Mason died at Gunston Hall, Va., Oct. 7, 1792.

MASON, JAMES MURRAY (1798-1871), American statesman, was born in Fairfax Co., Va., on Nov. 3, 1798, the grandson of George Mason. In 1820 he began practicing law at Winchester, Va. He was a delegate to the Virginia Constitutional Convention in 1829, and served in the state legislature from 1826 to 1832. Elected as a Jackson Democrat in 1837 he served one term in the House of Representatives. In 1847 he was elected to the United States Senate, where he became a prominent advocate of slavery and states rights. In 1850 he wrote and presented the Fugitive Slave Law. Leaving the Senate when Virginia seceded, he accepted appointment as a commissioner of the Confederate government to England in 1861, and sailed on the *Trent* which was captured by a federal warship. Mason was held in Boston two months and then released. In London he was not officially recognized, but remained in Europe endeavoring unsuccessfully to obtain the active support of England and France for the Confederacy. After the war he lived in Canada until 1868. He died at Alexandria, Va., on Apr. 28, 1871.

MASON, JOHN (1586-1635), American colonist and founder of New Hampshire, was born at King's Lynn, Norfolk, England, Dec. 1586. He was educated at Magdalen College, Oxford. In 1617, he explored the New England coast and in 1622 obtained a grant for land in northeastern Massachusetts. In 1629 he procured a patent for the colony of New Hampshire and in 1635 he was appointed vice-admiral of New England. He died in London, Dec. 1635.

MASON, JOHN YOUNG (1799-1859), American public official, was born in Greensville, Sussex Co., Va., Apr. 18, 1799. He was educated at the University of North Carolina, and was admitted to the bar in 1819, and soon obtained both a lucrative law practice and a large political following. He served as state and federal judge and as a member of the Virginia Assembly. From 1831-37 he served as representative from Virginia. He was Secretary of the Navy in President Tyler's cabinet, 1844-45, served as Attorney General, 1845-46, under President Polk, and upon George Bancroft's resignation again became secretary of the Navy, 1846-49. He was Minister to France, 1853-59, and with James Buchanan



COURTESY AMERICAN MUSEUM OF NATURAL HISTORY

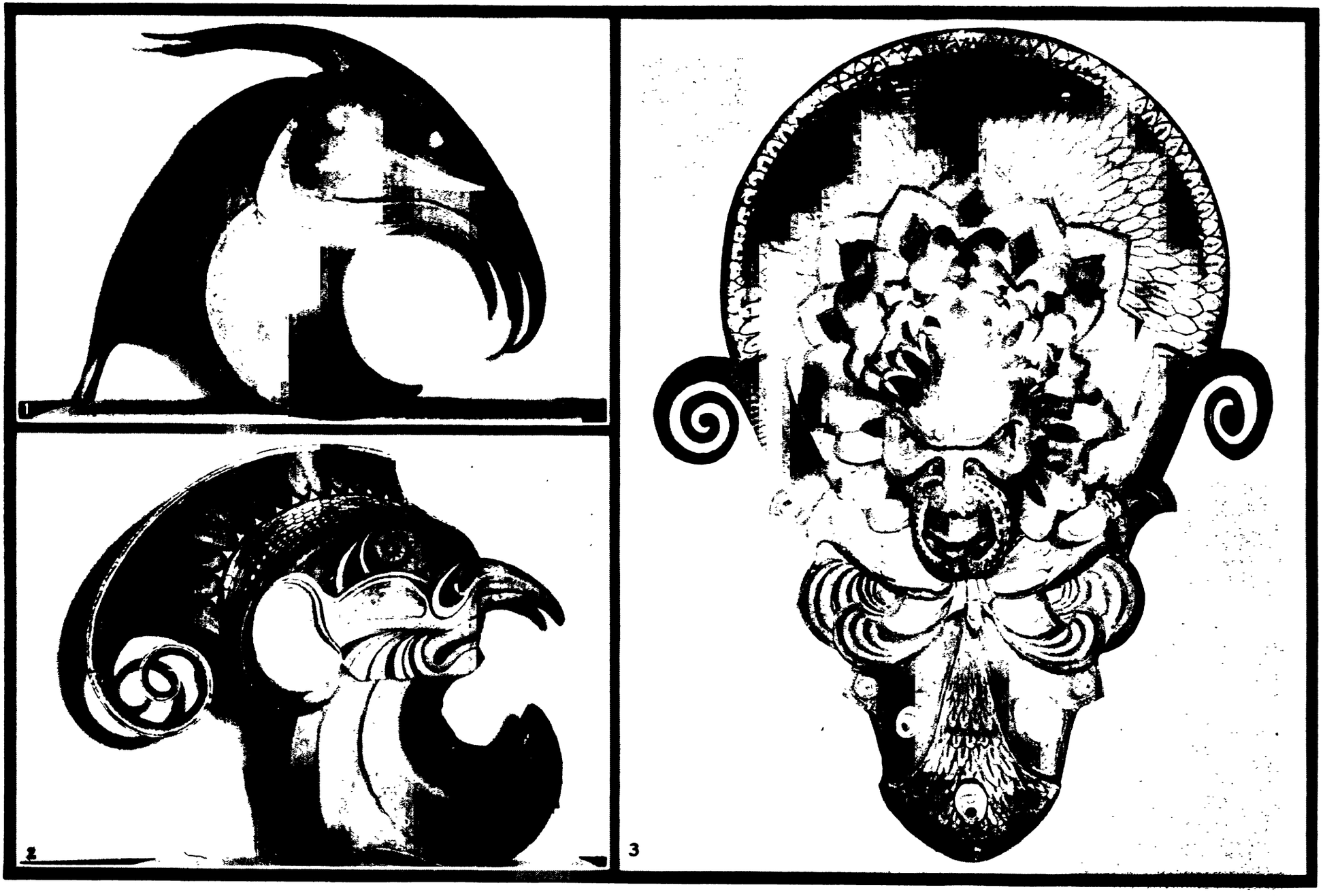
AFRICAN AND AMERICAN ABORIGINAL MASKS

1. Javanese mask. **2.** Wooden ceremonial mask of French Guinea, West Africa. **3.** Primitive mask from the Belgian Congo, Africa. **4.** Finely carved wooden mask used by the False Face Society of the Iroquois Indians of North America.



MODERN MASKS DESIGNED BY WLADYSLAW T. BENDA

1. A Geisha. **2.** Dolorosa. **3.** A diplomat. **4.** Stryga (creature of Polish folklore). **5.** The Jester.



MASKS CREATED BY WLADYSLAW T. BENDA

1. Phenix. **2.** Wilkolak (creature of Polish folklore). **3.** The Green Dragon.

and Pierce Soule signed the OSTEND MANIFESTO. He died in Paris, Oct. 3, 1859.

MASON, LOWELL (1792-1872), American musician, was born at Medfield, Mass., Jan. 24, 1792. He was entirely self-taught. He made a collection of Psalm Tunes, afterward published at Boston as *The Handel and Haydn Society's Collection of Church Music*. This met with such success that Mason settled in Boston, where in 1832 he founded the Boston Academy of Music. He died at Orange, N.J., Aug. 11, 1872.

MASON, OTIS TUFTON (1838-1908), American anthropologist, was born at Eastport, Me., Apr. 10, 1838. He graduated in 1861 at Columbian (now George Washington) University, and was principal of its preparatory school during 1862-84. In the latter year he became curator of the department of ethnology of the United States National Museum at Washington, D.C., where he was acting head-curator of the department of anthropology from 1902 until his death, at Washington, Nov. 5, 1908. He was a founder of the Anthropological Society of Washington. His pioneer work in collecting and classifying materials relating to anthropology was of considerable importance to the growth of that science in America. Mason was the author of many books and monographs, most of the latter appearing in the reports of the Smithsonian Institution. His most important works are *The Human Beast of Burden, Woman's Share in Primitive Culture, The Origin of Inventions* and *Aboriginal American Basketry*.

MASON AND DIXON LINE, the boundary line run between Maryland and Pennsylvania, 1763-67, by Charles Mason and Jeremiah Dixon, two English surveyors. These surveyors were stopped by Indians in 1767 at a point 244 miles from the Delaware River, and the boundary was subsequently completed by others. Its exact latitude is 39° 43′ 26.3″ N. This line was popularly accepted as the demarcation between slave territory and free territory, and is currently referred to as the dividing line between the North and the South.

MASON BEE, any one of several species of BEES which make their cells of a mixture of earth and some fluid, which is thought to be secreted by the salivary glands. Such nests are cement-like in consistence.

MASON CITY, a city in northern Iowa, the county seat of Cerro Gordo Co., situated 137 mi. north of Des Moines. The city is a large railroad center and shipping point for corn, oats and live stock raised in the vicinity, and also for packing house products, cement, iron work and beet-sugar. In 1929 the manufactures amounted approximately to $30,000,000; the retail trade reached a total of $15,900,060. Bus and truck lines afford additional transportation. There is an airport. Clear Lake, an attractive watering resort and State Park, is 10 mi. away. Mason City was founded in 1853 and incorporated in 1881. Pop. 1920, 20,065; 1930, 23,304.

MASONITE. *See* FIBER BOARDS.

MASONRY, a term applied to that portion of a structure which is made up of units bonded together with MORTAR. Stone masonry in building construction is used principally as a facing backed up with common brick or tile. Limestones, sandstones and granites are most commonly used. The mortar used in connection with stone work must not stain the stone. Brick masonry is used for exterior walls and occasionally for interior fire walls. For buildings up to about six stories high, the brick walls are ordinarily designed to carry the floor load. For buildings of greater height, the weight of the brick walls is carried at each floor line by means of structural steel, the walls in this case simply serving to enclose the building.

Frequently the outer facing of brick for these walls is backed up with hollow clay or concrete tile. Division and fire walls are usually constructed of brick.

Interior partitions, enclosing vertical shafts or stairs, are constructed of brick: hollow tile of clay, concrete, or gypsum. The interior partitions forming the rooms in fireproof buildings are usually of gypsum, light structural clay or concrete. G. A. H.

MASONS, are members of a Lodge of Free and Accepted Masons. Freemasonry is founded on belief in God as the Father of all Men, and attempts to spread the thought of universal brotherhood. By far the largest number of the Society of Free and Accepted Masons is to be found in English speaking countries. In 1931, the Lodges in Great Britain numbered about 6,000; in the U.S. 16,600; with a world total of about 28,000 lodges. The English speaking membership is approximately 4,180,000; other languages, 263,000, with a grand total of 4,443,000.

The origin of Freemasonry has become obscured by efforts of writers, notably in the 18th century, to identify the birth of the fraternity with antiquity. Modern research has fairly proved that Freemasonry is a distinctly British institution, first assuming organized form in 1717, when the membership of four London Lodges met to form the original Grand Lodge. At the start, provision was made for only one degree, but soon two others were added. The three degrees of Freemasonry are those of Entered Apprentice, Fellowcraft and Master Mason, each with its own ritual. These three degrees are practiced by all lodges of Masons throughout the world. Royalty was quick to patronize a fraternity which laid stress on loyalty to country. Popularity soon led to a schism. In 1813 the two rival Grand Lodges, with headquarters in London, combined and formed the United Grand Lodge of England. Meanwhile Masonry had spread rapidly over the British Empire and the Continent. In the U.S. it was introduced about 1730. Benjamin Franklin was a member of one of the early American Lodges.

Masons are forbidden to ask anyone to join the society. A person wishing to become a Mason must make known his desire to a member of the fraternity. He is then given a form to fill out and must give as reference another Mason. If the applicant is acceptable to a Lodge which receives his petition, he is so notified and allowed to take the three degrees of the

Lodge, on the satisfactory passing of which he becomes a Mason and a member. From the Lodge, if he so desires, he can take steps to become a Royal Arch Mason, a Knight Templar, Shriner or a member of other special organizations composed of Masons. Continuance as a member of a Lodge is all that is required to partake of Masonic privileges throughout the world.

The Lodges of any particular territory, country, or state, are combined in a Grand Lodge, in which each has a voice, according to its numerical strength. Each Grand Lodge is independent of every other and is supreme in its own territory. It may or may not enter into fraternal relations with other Grand Lodges, but such relationship means nothing more than interchange of correspondence, inter-visitation, and the right of members to transfer their membership from one to the other, within the fellowship.

Aside from promoting social intercourse within the circle of fraternally related Grand Lodges, the Masons carry on in their several jurisdictions many welfare enterprises, such as homes for orphans and indigent aged men and women; hospitals, day nurseries, vacation camps for under-privileged children, outside relief, care of members and their families in time of sickness and death, and other charitable undertakings.

A great many organizations have been formed, which require that candidates for admission must be Master Masons, in good standing in a recognized Lodge. Three principle Rites have been derived from the original three degrees of the Lodge. The English Rite consists of the degrees of the Lodge and "the Holy Royal Arch." The American Rite adds to the degrees of the Lodge those of Mark Mason, Past Master, Most Excellent Master and Royal Arch Mason; then follow the degrees conferred in Councils, Royal and Select Masters; and finally the degrees of the Red Cross, Knight Templar, and Knight of St. John and Malta, conferred in Commanderies of Knights Templar. The Ancient and Accepted Scottish Rite was created in 1801 at Charleston, S.C., and works degrees up to that of Sovereign Grand Inspector-General of the Thirty-Third Degree.

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MASPERO, SIR GASTON CAMILLE CHARLES (1846-1916), French Egyptologist was born of Italian parents in Paris, June 23, 1846. In 1874 he succeeded De Rouge as professor of Egyptology in the Collège de France. From 1881 to 1886 he was director of the Bulak Museum and from 1899 to 1914 was in charge of all excavation in Egypt. His discoveries at Sappara, Karnak, Deir-el-Bahri and elsewhere have added much to the world's knowledge of ancient Egyptian civilization. Among his many valuable books on Egyptology are *Egyptian Archaeology, Life in Ancient Egypt and Assyria,* and *Dawn of Civilization.* Maspero died in Paris, June 30, 1916.

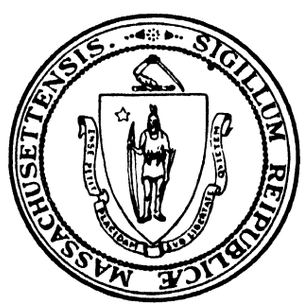
MASQUE, a type of private theatrical performance fashionable in England in the 16th and 17th centuries. Originating in the reign of Henry VIII and named for the masks which the players wore, the masque was elaborately spectacular, richly costumed and mounted, and dependent upon stage machinery and music and dancing. Only the nobility could afford to present masques, so costly were they to produce. The finest masques were written by BEN JONSON, in the first part of the 17th century; among his best may be mentioned *The Masque of Blackness, Hymenaei* and *The Masque of Beauty.* With Milton's *Comus,* 1634, the masque assumed genuine literary qualities. *See also* ENGLISH DRAMA.

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MASS, the Eucharist or Lord's Supper celebrated in Christian worship. The word is derived from the Latin, *Ite, missa est* (Depart, the congregation is dismissed), given by the priest in the Catholic Church before the beginning of the communion service. The Mass falls into six chief divisions: Kyrie, Gloria, Credo, Sanctus, Benedictus, and Agnus Dei. Since the time of St. Ambrose in the 4th century the text falling under these heads has been chanted, originally in Plain Song, but after the beginning of the 15th century in contrapuntal fashion. The dramatic beauty of the words has inspired the genius of the greatest composers who, beginning with PALESTRINA (c. 1525-94), have lavished their contrapuntal skill upon this sacred drama which ranges from supplication and exalted praise to profound pity. Among the celebrated masses are Palestrina's *Marcelline Mass* which, first performed on June 19, 1565, induced Pope Pius IV and his cardinals to remove a threatened injunction against contrapuntal music, J. S. Bach's *Mass in B Minor,* and Beethoven's *Missa Solemnis in D Major.* Between a high mass and a low mass there is no difference save a musical one, the former, also called Missa Cantata, being sung or chanted, the latter being merely spoken by the celebrant.

MASSACHUSET, an important confederacy of the North American Indian Algonkian linguistic stock, closely allied to the Narragansett. As early as the time of the arrival of the English colonists in 1617, the Massachuset were reduced in number, and consequently they took no important part in any encounters between the Colonists and the Indians. At the time of colonization they inhabited the present site of Boston and its environs.

MASSACHUSETTS, a New England state, one of the original thirteen states of the United States, popularly called the "Bay State." It is situated between 41° 15′ and 42° 50′ N. lat. and 69° 55′ and 73° 30′ W. long. On the north it is bounded by Vermont and New Hampshire, on the east by the Atlantic Ocean, on the south by Rhode Island and Connecticut and on the west by New York. Massachusetts comprises an area of 8,266 sq. mi., inclusive of 227 sq. mi. of water surface. In shape the state is roughly a



MASSACHUSETTS STATE SEAL

parallelogram, with a maximum length of 184 mi. from east to west and a maximum breadth of 113 mi. from north to south. In size Massachusetts ranks forty-fourth among the states of the Union.

Surface Features. The Appalachian Mountain province which carries over into New England provides western Massachusetts with a highland region and the eastern two-thirds of the state with a peneplain similar to the Piedmont Plateau. The Connecticut River separates them.

The mountain region is divided locally into the Hoosac Mountains, 1,200 to 1,600 ft. high, lying close to the Vermont border, and the BERKSHIRE HILLS. Among the summits of the latter are Mt. Williams, 3,040 ft., and Mt. Greylock, 3,505 ft., which is the highest elevation in the state. A few isolated peaks such as Mt. Tom, Mt. Holyoke and Mt. Toby, rise from the level of the Connecticut Valley.

The eastern part of the state is an uneven upland characterized by bare scalps of rock which protrude through the thin soil, and rounded hills or drumlins near the coast. The state as a whole has a mean elevation above sea level of 500 ft.

Massachusetts has 421 mi. of tidal coast line indented by expansive inlets, notably Massachusetts, Cape Cod and Buzzards bays. The northern coast is rocky and bold whereas Cape Cod is low and sandy. Two large islands, Martha's Vineyard and Nantucket, lie directly south of Cape Cod.

Climate. Exhibiting great extremes of temperature and marked local variations in wind movement and rainfall, the climate of Massachusetts, though sometimes severe, is bracing and healthful. The southeastern coast, including Cape Cod, is mildest. At Boston the mean annual temperature is 49.6° F., ranging from a mean of 27.9° F. for January to 71.7° F. for July, with an average annual precipitation of 40.1 in., including 44.2 in. of snow. In the interior the temperature is slightly lower and in the more elevated districts is productive of severe winters. In the summer and autumn the weather is generally excellent, especially in the Berkshires. At Boston the average date for the last killing frost in spring is April 14 and that of the first killing frost in autumn is October 24, giving an average growing season of 193 days.

Forests and Parks. The principal native trees are species of oak, maple, chestnut, ash, birch, beech and basswood. Hemlock, red spruce and balsam fir are found on the mountains. Forests which originally covered practically the entire land area have been entirely cut over. The forest area, according to a 1929 estimate, is 3,000,000 acres. Forty-four state forests with a total area of 109,000 acres have been well developed with roads, trails and camp sites with fireplaces and water facilities. A State Forest Commission was formed in 1914 which in 1920 became the Division of Forestry under the Department of Conservation. Its activities include purchase and maintenance of state forests, maintenance of forest nurseries, fire prevention, extension work and the suppression of the gypsy and brown tailed moths. Massachusetts cooperates with the Federal Government under the Clarke-McNary Law and in 1930, in addition to an appropriation for fire protection, 3,860,215 trees were distributed for reforestation purposes. A permanent Federal forest experimental station has been established at Northeastern. Five of the state forests are game sanctuaries and there are in addition 11 game preserves with a total area of over 2,824 acres. These contain rabbits, pheasants, grouse and water and shore birds. The majority of the eight state parks, all of physiographic interest, are forested. Several, such as MT. GREYLOCK, MT. TOM and Wachusett Mountain have public camp sites. The Standish Monument Reservation containing a monument to Captain Myles Standish is a 25-acre tract commanding an excellent view of Duxbury Bay.

Minerals and Mining. Quarry stone, mostly granite for building purposes, and basalt or trap rock, together with clay, sand and gravel, are the chief mineral resources. In value building stones form more than one-half of the output of the state. With mineral productions in 1929 amounting to $16,030,807, Massachusetts stood thirty-third among the states, ranking first in granite, second in sand-lime brick, fifth in lime and sixth in marble. The principal product was stone, valued at $8,513,162, including granite $5,394,350, basalt $2,191,366, limestone $411,217 and marble $202,001. Next in order of value were sand and gravel, $3,503,576; clay products, $2,571,951, and lime, $1,443,984.

During 1929 104 mines and quarries gave employment to 2,740 persons who received $4,867,699 in salaries and wages.

Soil. Almost the entire state exhibits granitic soils of glacial origin and, on the whole, like the rest of New England, is poorly adapted to agriculture. The valley of the Connecticut River, however, possesses highly fertile alluvial deposits and is sufficiently level for cultivation of tobacco and other valuable crops. In the highly acid soils of partially filled glacial lakes cranberries are extensively grown.

Agriculture. The chief crops produced are vegetables, hay, fruits and tobacco.

In 1930 2,005,461 ac. or 39.0% of the entire land area was in farms, 25,598 in number, with an average size per farm of 78.3 ac. and an average value per acre of $130.26. Of the farm area 564,054 ac. was cropland; 753,088 ac., pasture land; and 517,850 ac., woodland. The total value of farm property was $303,836,647, of which $261,222,390 was represented by land and buildings; $18,730,074, by implements and machinery; and $23,884,183, by domestic animals.

According to the census of 1930 Massachusetts produced in 1929 field crops to the value of $30,518,241, ranking forty-first among the states. It stood first in cranberries, sixth in onions and thirteenth in tobacco. The chief crops were vegetables, $10,559,637; hay and forage, 421,070 tons, $7,934,712; fruits, $6,765,130, and tobacco, of which 11,610,993 lbs. were

grown on 8,095 acres, $4,805,230. The principal vegetables were potatoes, $1,770,470; dry onions, $961,984; sweet corn, $896,401; tomatoes, $657,777 and asparagus, $508,314. The leading fruits were apples, 2,219,280 bu.; cranberries, 22,020,660 qts., and strawberries, 3,991,230 qts. Farm products sold by cooperative marketing rose from $1,671,099 in 1919 to $4,987,958 in 1929, and farm supplies purchased by this method from $521,547 to $2,544,891. Farm machinery and equipment in 1930 included 17,638 automobiles, 9,572 motor trucks, and 3,921 tractors.

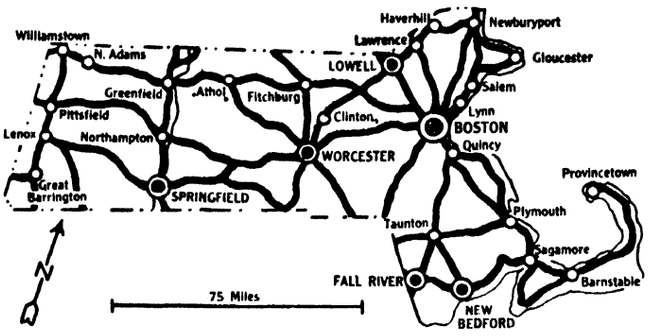
Animal Industry. Dairying and poultry keeping are the chief animal industries. According to the census of 1930 Massachusetts ranked forty-third among the states in the total value, $23,884,183, of domestic animals on farms. Among these were cattle, 207,389, valued at $16,830,140; horses, 24,797, $2,910,455; swine, 104,768, $1,469,410, and sheep, 12,716, $110,114.

Of the cows on farms, 137,463 were kept mainly for milk production and 3,640 mainly for beef production. In 1929, 85,420,875 gals. of milk were produced; the value of dairy products sold, mostly whole milk, was $23,347,883. The value of all poultry raised was $9,066,246. The number and value of the chief kinds were chickens, 5,087,789, $8,035,006; ducks, 525,170, $670,052, and turkeys, 61,396, $341,204. The chickens sold, 2,829,459 in number, were valued at $4,460,089. Of 18,102,324 doz. chicken eggs produced, valued at $8,874,045, 14,623,609 doz., with a value of $7,184,577, were marketed.

Fisheries. From almost the year of its founding, fishing was the leading industry of Massachusetts Bay Colony and was considered of such importance that it was tax-exempt. Early in the 17th century, many fishing villages had sprung up along the coast and fish became an important article of export. Chief among these settlements was Gloucester, which still retains its pre-eminence as a fishing center. In the 18th century New Bedford became a famous whaling port.

Vessels from the Bay State fish the grounds from Nantucket Shoals to the Grand Banks. The catch in 1930 amounted to 447,689,000 lbs., valued at $18,053,000, Massachusetts thus ranking first in the country. The principal fish taken are cod, mackerel, haddock, herring, pollack, hake, flounder, clams, crabs and squid. In 1930 the state issued 12,476 fishing licenses, receiving $285,383 in fees. Seven hatcheries are operated by 11 men, and $56,115 was spent on this work during the year. The state output was 580,736 trout, 286,406 bass and 721,339 other game fish. Wilkinsonville and Winchester have two of the largest hatcheries. The United States Bureau of Fisheries hatchery at Woods Hole is one of the largest in the country and produces annually an enormous number of fingerlings and yearlings. In 1930, the following were planted in Massachusetts waters: 82,608 rainbow trout, 100,000 loch leven trout, 150,000 brook trout, 1,500,360 yellow perch and several thousand other game fish. Marine species were: cod, 1,105,644,000; haddock, 131,840,000; pollack, 616,693,000, and winter flounders, 902,051,000.

Transportation. The first railroad in the United States was constructed in Massachusetts in 1826-27. It was the Quincy Road, a gravity and horse-power road 3 mi. long, used to convey granite for the Bunker Hill Monument from the Quincy quarries. In 1835, steam railroads were completed from Boston to Lowell



MASSACHUSETTS STATE ROADS

and from Worcester to Providence. One of the state's outstanding public works was the construction of the Hoosac tunnel, 4¾ mi. long, cutting through the Hoosac Mountains to connect Boston and Albany, N.Y. Although this tunnel was of great importance in 1873, its facilities are now inadequate to handle the possible volume of transcontinental railway traffic. In 1930 the total railway mileage was 2,016, with the Boston & Albany, Boston & Maine and New Haven the most important systems. The port of Boston, which now affords world-wide steamship transportation, was formerly the seat of the clipper shipbuilding industry. The CAPE COD CANAL shortens the distance between Boston and Vineyard Sound by 70 mi.

On Jan. 1, 1930, the state's highway system showed a total mileage of 28,086, including 9,324 mi. of surfaced roads and 1,625 mi. of improved state highways. Highway expenditures during 1929 were $26,581,158, of which $13,846,158 was paid by the state and $12,735,000 by county and local governments. The state gasoline tax produced a gross revenue of $10,562,947 in 1930. Motor vehicle registrations were 846,206 in 1930 compared with 646,153 in 1925. The growth of transportation by truck is indicated by registrations, which increased from 91,340 in 1925 to 102,918 in 1930. During the same period the number of buses in operation went from 1,930 to 3,064, an increase of nearly 60%.

Commerce. According to the census of 1930, there were in 1929 6,067 wholesaling establishments in Massachusetts with total sales of $3,087,684,593. This volume represented 4.44% of the total wholesale trade of the United States and was exceeded in only six states. These wholesalers employed 72,973 men and women whose annual salaries aggregated $146,000,585. The chief wholesaling center is Boston, with Springfield, Cambridge, Worcester, Lynn and New Bedford also important.

The total sales of the 53,845 retail stores amounted to $2,058,887,788, a volume surpassed in only seven states. Sales per store averaged $38,230. This average store sale was higher than every other state except Michigan. Sales per capita which amounted to $484.49, were higher in only New York, California, Nevada and Washington.

CHIEF RETAIL DISTRIBUTING GROUPS

Group	*No. of Stores*	*Sales*	*% of Total*
Food	22,070	$556,881,415	27.04
Automotive	6,960	327,141,505	15.89
General Mdse.	2,509	318,401,850	15.47
Apparel	5,200	199,793,237	9.70
Lumber & Bldg.	2,196	114,098,730	5.54
Furn. & Household	1,508	88,047,337	4.28
All other stores	13,402	454,523,714	22.08
Total, all stores	53,845	$2,058,887,788	100.00

Boston, the principal port, handled water-borne traffic amounting to 19,065,050 tons, with a value of $999,683,062. The Cape Cod Canal which handled 2,165,465 tons with a value of $108,358,255, was also important.

Manufactures. The chief industrial interests of Massachusetts have long been associated with manufacturing. In this field the state early attained preeminence and still holds high rank. While supremacy in cotton manufacture has passed to the South, the state is still the outstanding producer of textiles as a whole and continues to lead in making boots and shoes. However, these products, though highly important, comprise but a small fraction of the state's diversified manufactures. Important factors in this industrial development were the early utilization of water power and improved machinery, proximity to substantial markets and adequate transportation.

According to the census of 1930 Massachusetts with manufactures for 1929 valued at $3,392,162,237 stood seventh among the states. Its 9,872 establishments gave employment to 81,670 officers and employees, who received $215,218,070 in salaries, and to 557,494 wage earners, who were paid $694,805,312 in wages. These factories used a total of 2,068,521 horse power, expended $73,789,233 for fuel and power, and $1,607,643,555 for materials and supplies, and added by the process of manufacture $1,710,729,449 to the value of their output.

In this output there were about 200 separately enumerated groups of manufactures. The state stood first in boots and shoes, woolen goods, worsted goods, textile machinery, cutlery, cordage, envelopes and silverware. It ranked second in dyeing and finishing textiles, leather, pumps and toys, and third in cotton goods, wool rugs and carpets, clocks, jewelry, pianos and confectionery. In such important items as women's clothing, paper and machine tools the state stood fourth. Massachusetts ranked fifth in silk and rayon, ship building, canned fish, book and job printing, steam fittings and patent medicines; sixth in knit goods, men's clothing, bread and bakery products, printing and publishing newspapers and periodicals, and electrical machinery; seventh in ice cream and coffee grinding, ninth in furniture, and tenth in foundry and machine shop products.

The leading manufactures, which included about three-fifths of the output of the state, in order of value were:

Industry or Product	*No. Persons Employed*	*Value of Products $*
Boots and shoes	60,187	241,587,864
Cotton goods	73,238	233,618,009
Electrical machinery	35,221	184,786,944
Worsted goods	31,593	171,817,773
Foundry and machine shop products	25,779	114,965,036
Paper	13,663	93,317,072
Dyeing and finishing textiles	16,050	93,148,770
Leather	11,805	88,348,403
Bread and bakery products	11,476	80,270,302
Printing and publishing, newspaper and periodical	11,898	76,840,313
Woolen goods	16,649	71,080,687
Meat packing	3,251	64,354,688
Printing and publishing, book and job	12,269	61,892,665
Boot and shoe cut stock	3,257	47,782,256
Confectionery	8,657	43,932,366
Women's clothing	7,663	43,100,869
Furniture	9,767	41,921,577
Manufactured gas	6,211	41,264,782
Textile machinery	12,042	41,202,970
Knit goods	9,655	41,050,135
Rubber boots and shoes	13,170	40,250,364

About three-fourths of the state's manufactures were produced in the industrial area lying east of Worcester Co. Boston, with products valued at $613,303,031, was the leading manufacturing city. Others of importance were Worcester, $215,798,511; Cambridge, $174,621,196, and Lawrence, New Bedford, Springfield, Lynn, and Fall River, between $100,000,000 and $130,000,000 each.

Finance and Banking. The assessed value of all real property in Massachusetts in 1930 was $6,403,062,297. On Jan. 1, 1930, the state's net bonded indebtedness was $66,992,964. Total revenue receipts for the year ended Nov. 30, 1928 were $59,348,470; total expenditures, $51,769,991. The principal sources of revenue were property taxes, $28,487,265 and licenses, $16,618,000. This item included motor vehicle, corporation and insurance company taxes. The principal expenditures were for operation of general departments, $41,533,191, highways, $12,376,511, permanent improvements, $8,585,695, and debt service, $1,466,824.

The Massachusetts Bank, founded in Boston in 1784, was the second bank organized in the United States. Five banks were doing business here by 1800. In 1803, Massachusetts became the first state to require semi-annual bank reports, to be sworn by the directors. Although a comprehensive banking law was passed in 1829, limiting capitalization and circulation, evasion became so general that a system of official examination by a board of bank commissioners was adopted in 1838. The new system produced results, as only one bank failed in the panic of 1857. With the advent of national banking, state banks of

discount were prohibited. Trust companies, which may make loans on real estate, have become very popular. In 1930 there were 491 banks in Massachusetts, of which 151 were national banks, 335 trust companies and 5 private banks. These institutions had an aggregate capital of $167,070,430; their surplus and undivided profits amounted to $379,913,000. Their total resources were $4,920,453,000, with loans and discounts aggregating $2,954,858,000. Demand deposits totaled $1,102,803,000; time deposits, including postal savings, were $2,831,592,000. Per capita demand and time deposits were $923.57; per capita savings deposits, $640.09. The total savings of $2,726,799,000 were owned by 4,193,171 depositors. National bank circulation in 1930 was $19,418,000.

Government. The legislative department, known as the General Court of Massachusetts, consists of a senate composed of 40 members and a house of representatives of 240 members, all elected for terms of two years and meeting in annual sessions unlimited in duration. The chief executive of the commonwealth is the governor elected for a term of two years at a yearly salary of $10,000. Other executive officials are the secretary, treasurer, receiver general, auditor and attorney-general. Highest judicial authority is vested in the supreme judicial court composed of seven judges chosen by the governor and council to hold office during good behavior. The chief justice has a salary of $10,500 and the other judges $10,000 per annum. There is a superior court consisting of 16 judges and each county has a probate court and a court of insolvency.

Social Welfare Institutions. State institutions are grouped under and controlled by different departments. The Department of Public Welfare has an infirmary for dependents at Tewksbury, a hospital school for the care and education of crippled and deformed children at Canton, an Industrial School for Girls at Lancaster, an Industrial School for Boys at Shirley and the Lyman School for Boys at Westborough. The Health Department has tuberculosis hospitals at Rutland, Westfield, Lakeville and North Reading and a hospital for cancer patients at Pondville. The Department of Mental Diseases has hospitals for the insane at Worcester, Taunton, Danvers, Northampton, Westborough, Boston, Medfield, Grafton, Gardner and Foxborough. It maintains hospitals for epileptics at Palmer and for feeble-minded at Wrentham and a state school for feeble-minded at Belchertown. The Walter E. Fernald State School and the Metropolitan State Hospital are at Waltham. The latter has cottages for children at Baldwinsville. There is also a Psychopathic Hospital in Boston. The Department of Correction has a reformatory for women at Framingham, for men at Concord, a prison camp and hospital at West Rutland, a hospital for criminal insane and farm for criminals at Bridgewater, a state prison colony at Norfolk and prison at Charlestown. The state also has supervision over many private charitable institutions.

Education. The first school in Massachusetts was located in Boston in 1635, within five years of the settlement of that city. A school at Charlestown was taught by William Witherell in 1636, and one at Salem was opened the following year. In 1642 and 1647 Massachusetts' famous school laws were enacted requiring every town of 50 families to appoint a schoolmaster to teach the children of the town to read and write and every town of 100 families to provide a grammar school. The modern educational system in Massachusetts began in 1840. In 1929-30, there were 744,246 pupils and 25,573 teachers in all schools. The 249 public high schools had 129,926 pupils and 5,518 teachers. School attendance laws require children from 7 to 14 years of age to attend school the full school year.

The number of persons from 5 to 20 years of age attending school in 1930 was 910,482, or 75% of the population within the ages specified, as compared to 721,326, or 68.4%, in 1920. Persons 10 years and over unable to read and write in 1930, numbered 124,158, or 3.5%, as compared to 146,607, or 4.7%, in 1920. Foreign-born white illiterates numbered 111,568, or 10.7% of that group in 1930, as compared to 135,720, or 12.8%, in 1920.

Of the many institutions for higher education the state controls the Massachusetts Agricultural College at Amherst; the textile institutes at Fall River, New Bedford and Lowell; normal schools at Salem, Bridgewater, Fitchburg, Framingham, Hyannis, Lowell, North Adams, Westfield and Worcester. Other educational institutions of importance are Harvard University at Cambridge, Amherst College at Amherst, Williams College at Williamstown, Boston University, Tufts College at Medford, Clark University at Worcester, Worcester Polytechnic Institute, Massachusetts Institute of Technology at Cambridge; and for women only, Mount Holyoke at South Hadley, Wellesley College near Boston, Smith College at Northampton, Simmons College at Boston and Radcliffe College at Cambridge. The Division of Public Libraries, Department of Education, has headquarters in the State House in Boston.

Population. In 1930 Massachusetts ranked eighth among the states with a population of 4,249,614 or an average of 528.6 per sq. mi., an increase of 397,258 or 10.3% over 1920. The population rose from 378,787 in 1790 to 994,514 in 1850, 2,805,346 in 1900, 3,366,416 in 1910 and to 3,852,356 in 1920. In 1930 there were 4,192,926 or 98.7% whites and 52,365 or 1.2% Negroes. Of the whites, 3,138,290 were native born and 1,054,636 were foreign born, a decrease in the latter of 22,898 from 1920. Of the total foreign stock, including foreign born, foreign and mixed parentage, 496,907 or 18.0% were Irish, 387,929 or 14.0%, Canadian (other than French); 336,871 or 12.2%, French Canadian; 322,676 or 11.7%, Italian. The urban population was 3,831,426 or 90.2% of the total; the rural, 418,188 or 9.8% of the total. In 1930 the largest cities were Boston, 781,188; Worcester, 195,311; Springfield, 149,900; Fall River, 115,274; Cambridge, 113,643; New Bedford, 112,597.

Occupations. In 1930 1,814,315 persons, or 42.7% of the population, were gainful workers 10 years old or older; 70.8% of these were males and 29.2% females; 66.2% were native white, 32.3% foreign-born white and 1.4% Negro. Of the females 15 years old or older 68.1% were single, 21.1% were married and 10.8% were widowed or divorced.

Among the principal occupations were factory operatives and laborers, 269,496 men and 151,226 women, including 39,955 men and 24,715 women in shoe factories, 27,216 men and 28,236 women in cotton mills, and 20,178 men and 14,574 women in woolen and worsted mills; clerks, 74,325 men and 55,816 women; salespersons, 65,946 men and 24,536 women; servants, 15,389 men and 60,426 women; retail dealers, 65,237; farmers and farm wage workers, 51,706; chauffeurs, 46,956; bookkeepers and cashiers, 9,011 men and 31,019 women; school teachers, 6,648 men and 32,481 women; carpenters, 38,275; stenographers, 995 men and 36,416 women; machinists, 35,913, and painters and glaziers, 22,363.

HISTORY

After Bartholomew Gosnold's unsuccessful attempt to establish a colony on Cuttyhunk Island, 1602, a band of 102 PILGRIMS, who sailed from Leyden, Holland, and Plymouth, England (*see* MAYFLOWER), in 1620, founded the first permanent settlement in Massachusetts. The famous MAYFLOWER COMPACT served as their basis of government. Communal ownership of property was abandoned in 1624; the rights of the English mercantile company which had financed the little settlement of religious refugees were bought out in 1627; Plymouth Colony numbered 25,000 inhabitants and included seven towns beside the original settlement in 1640, and was self-governed along lines of congregational democracy. But in 1691 Plymouth was absorbed into the larger, more powerful Massachusetts Bay Colony. The latter colony was the outgrowth of a fisheries enterprise which had maintained a post first at Cape Ann, 1623-1626, then at Salem. A company of PURITANS under John Endecott arrived at Salem in 1628; a royal patent for the colony was obtained, and, because of the dispute between the Puritans and Charles I, emigration was large. Religion, commerce, and patriotism were alike motives that made possible the colonization. Between 1630 and 1640 about 20,000 colonists arrived, to found Boston, Charlestown, Dorchester, Roxbury, Lynn, Medford and Mystic. Thomas Dudley, John Cotton, JOHN WINTHROP, the first governor, and other leaders attempted to maintain an undemocratic, strongly sectarian government; but the towns obtained representation in the General Court, and bent the trend of government toward representative democracy. Dissenting individuals, such as ROGER WILLIAMS, ANNE HUTCHINSON and Harry Vane, and extreme sects, such as Baptists and Quakers, suffered oppression.

Geographical isolation, the tradition of Protestant dissent, and the expansion of local commercial interests tended to separate Massachusetts in government and sentiment from Great Britain. In the PEQUOT WAR and King Philip's War the colony handled its Indian problem independently; it was much involved, but self-reliant, in the colonial wars between England and France. Its policy of evasion and delay in complying with orders from the Crown led to the annulment of the Massachusetts charter in 1684; but royal government under SIR EDMUND ANDROS fell when news of the overthrow of the Stuart dynasty reached Boston, and Massachusetts received a new charter in 1691. The new document, however, provided for a royal governor. The SALEM WITCHCRAFT delusion marks the dénouement of religious intolerance in Massachusetts; thereafter the colony assumed a more modern tinge, and Puritan morality was noticeably relaxed, while in politics growing liberalism was evident. The commercial welfare of Massachusetts suffered greatly from British colonial policy after 1763, and Boston became the center of Revolutionary agitation (*see* UNITED STATES, HISTORY, *Colonial Era*). JAMES OTIS, SAMUEL ADAMS, JOHN ADAMS, JOHN HANCOCK, and others of Massachusetts played leading parts in the chain of events which led to the REVOLUTIONARY WAR; their colony contributed more liberally in money, $820,000, and men, 67,000 troops, than any other. In 1780 a state constitution was adopted. The economic reaction from the war was violently expressed in SHAY'S REBELLION; but as its maritime industries recovered and expanded the state entered an era of prosperity which was supported by textile and other manufactures after English-built iron ships brought about the end of the "clipper era." The era was interrupted by the NON-INTERCOURSE ACTS and the WAR OF 1812, to which Federalist Massachusetts was violently opposed. Massachusetts was closely identified with the anti-slavery movement and with the other currents of intellectual progress of the 30 years preceding the CIVIL WAR. During that period there appeared in Massachusetts probably the finest productions of American literature. The state furnished 159,165 men to the Union forces of the Civil War. At first attached to the Republican party for sentimental reasons, it remained so, out of devotion to protective tariff, until the prohibition issue became perhaps the major political question. In 1928 the state gave its electoral votes to Alfred E. Smith and in 1932 to Franklin D. Roosevelt. In 1930, with the election of Marcus A. Coolidge, Massachusetts was represented in the Senate by two Democrats for the first time since the Civil War. In 1932 Joseph P. Ely, Democrat, was reelected to the governorship.

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MASSACHUSETTS AGRICULTURAL COLLEGE. *See* MASSACHUSETTS STATE COLLEGE.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, a coeducational technological and scien-

tific institution at Cambridge, Mass. It owes its foundation to a memorial presented to the Massachusetts legislature in 1860 by William Barton Rogers, the first president, calling for the establishment of a school to "aid generally by suitable means the advancement, development and practical application of science." Because of the Civil War the opening was postponed until 1865. The institute is a land grant college, and is privately controlled and non-sectarian. It is one of the largest schools of its type in the United States and one of the best equipped. The institute offers undergraduate courses in general science; architecture; architectural, aeronautical, chemical, civil, electrical, electro-chemical, general, mechanical, mining, naval and marine, sanitary and municipal engineering; engineering administration, and building construction. It affords opportunity for study and research leading to advanced degrees of master of science, and of architecture, and doctor of philosophy, of science, and of public health. The institution maintains a summer mining camp at Dover, N.J., and a civil engineering camp at East Machias, Me.

Massachusetts Institute had productive funds in 1931 amounting to $35,000,000. The library contained 250,000 volumes. In 1931-32 there were 3,162 students and a faculty of 500, headed by Pres. KARL T. COMPTON.

MASSACHUSETTS STATE COLLEGE, a co-educational state institution at Amherst, Mass., was established as Massachusetts Agricultural College in 1863 as a land-grant college under the Morrill Act of 1862. This institution is the only separate agricultural college in the United States. The State Experiment Station which was located at Amherst in 1882 has since been incorporated with the college. In 1931 the name of the institution was changed to Massachusetts State College. The appropriations for that year, Federal and State, were $1,226,765. Departments of Agriculture, Horticulture, Botany, Entomology, Plant and Animal Chemistry, Veterinary Science, Mathematics, and Social Sciences are maintained. The library, which contains 88,000 volumes, includes the Marshall P. Wilder Collection on Horticulture and the Karl A. Goessman College on Chemistry. In 1931-32 there were 1,136 students and a faculty of 203, headed by Pres. Roscoe W. Thatcher.

MASSASAUGA, the larger of the two pygmy rattlesnakes (*Sistrurus*). These snakes are readily distinguished from all the other rattlesnakes (*Crotalus*) by the presence of plates or large scales on the top of the head instead of numerous very small scales as in *Crotalus*. The massasauga (*S. catenatus*) ranges from western New York to Nebraska and southward into northeastern Mexico, but is not known from the southeastern states. It prefers swampy or damp regions where it preys on birds, small mammals and frogs. The bite is not fatal to adult man. A mature massasauga is about 2 ft. long.

MASSASOIT (1580-1661), Indian chief of the Wampancoag or Pokanoket tribe, was born in Massachusetts in 1580. His territory was roughly southern Massachusetts, and his tribe, once reputed to number 30,000, had shrunk to about 300 by the time that the Plymouth settlement was founded. In March 1621 he made a treaty of peace and mutual protection with Gen. J. CARVER at Plymouth, and this treaty he faithfully kept for 50 years. Massasoit was from first to last well disposed to the white colonists, showing much kindness to pilgrims and travelers and once taking care of ROGER WILLIAMS for six weeks at his tribal home at Sowams, now Warren, R.I. Massasoit died in 1661.

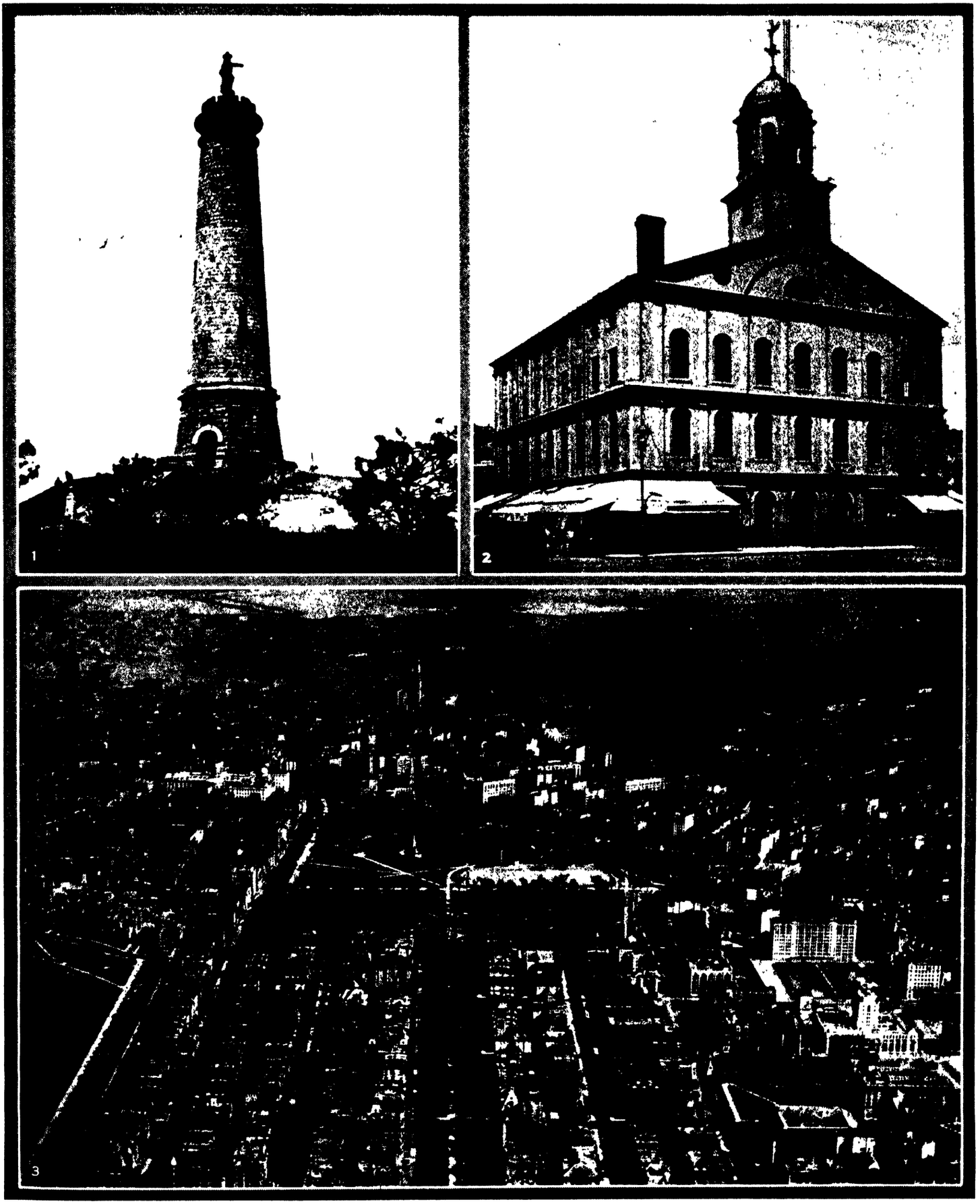
MASSENA, a village in St. Lawrence Co., northeastern New York, situated on the Grasse River, near the St. Lawrence, 38 mi. northeast of Ogdensburg. It is served by two railroads. Farming and dairying are the chief interests of the countryside. The village has various manufactures, including aluminum, mica products and silk. The retail business in 1929 amounted to $5,696,196. Pop. 1920, 5,993; 1930, 10,637.

MASSENET, JULES FRÉDÉRIC ÉMILE (1842-1912), French music composer, was born at Montaud, May 12, 1842. Winning the Prix de Rome at the Paris Conservatoire with his cantata *David Rizzio,* he entered the operatic field, achieving phenomenal success in 1884 with *Manon,* and moderate success with *Le Cid, Le Roi de Lahore,* and *La Navarraise. Thaïs* was produced in 1894, two years after the première of *Werther,* and *Le Jongleur de Notre Dame* was presented in 1902. In addition to his operatic compositions should be mentioned the oratorios *Eve* and *La Vierge,* three ballets, seven orchestral suites, and about 200 songs. Despite a somewhat sentimental style his craftsmanship is able. In 1878 he was elected to the French Academy, and in the same year he joined the faculty of the Paris Conservatoire, continuing there until 1896. He died at Paris, Aug. 13, 1912.

MASSET, one of the towns of the HAIDA Indians, situated on the east side of Masset Inlet, Queen Charlotte Islands, Brit. Col. The present Haida population of Masset consists of the remaining members of all the families which used to live between the Chawagis River and Hippa Island.

MASSIF, a French term used in geology to designate a large mass of igneous rock, of regular or irregular shape. It is not necessarily composed of one kind, but may be made up of various IGNEOUS ROCKS which together constitute a more or less homogeneous unit distinct from the surrounding formations.

MASSILLON, a city of northeastern Ohio, in Stark Co., situated on the Tuscarawas River and the Ohio Canal, about 8 mi. west of Canton and 50 mi. south of Cleveland. The Pennsylvania, the Baltimore & Ohio and the Wheeling & Lake Erie railroads, buslines and an airport serve the city. Massillon is located at an elevation of 1,065 ft. in a district both agricultural and industrial. Coal, gas, white sandstone, iron ore and potter's clay are found in the surrounding hills. The leading manufactures include steel and allied products, with a value in 1929 of $40,356,803; the retail trade in the same year



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BOSTON AND PLYMOUTH, MASSACHUSETTS

1. Monument to Miles Standish, Plymouth. **2.** Faneuil Hall, Boston, built in 1763. **3.** Air view of Boston, with the lofty Custom House tower and the Harbor in the background, and to the left, the Charles River Basin. In the center Commonwealth Avenue enters Boston Common. In the upper left is the white State House, and at the lower right Copley Square with Trinity Church and the Boston Public Library.

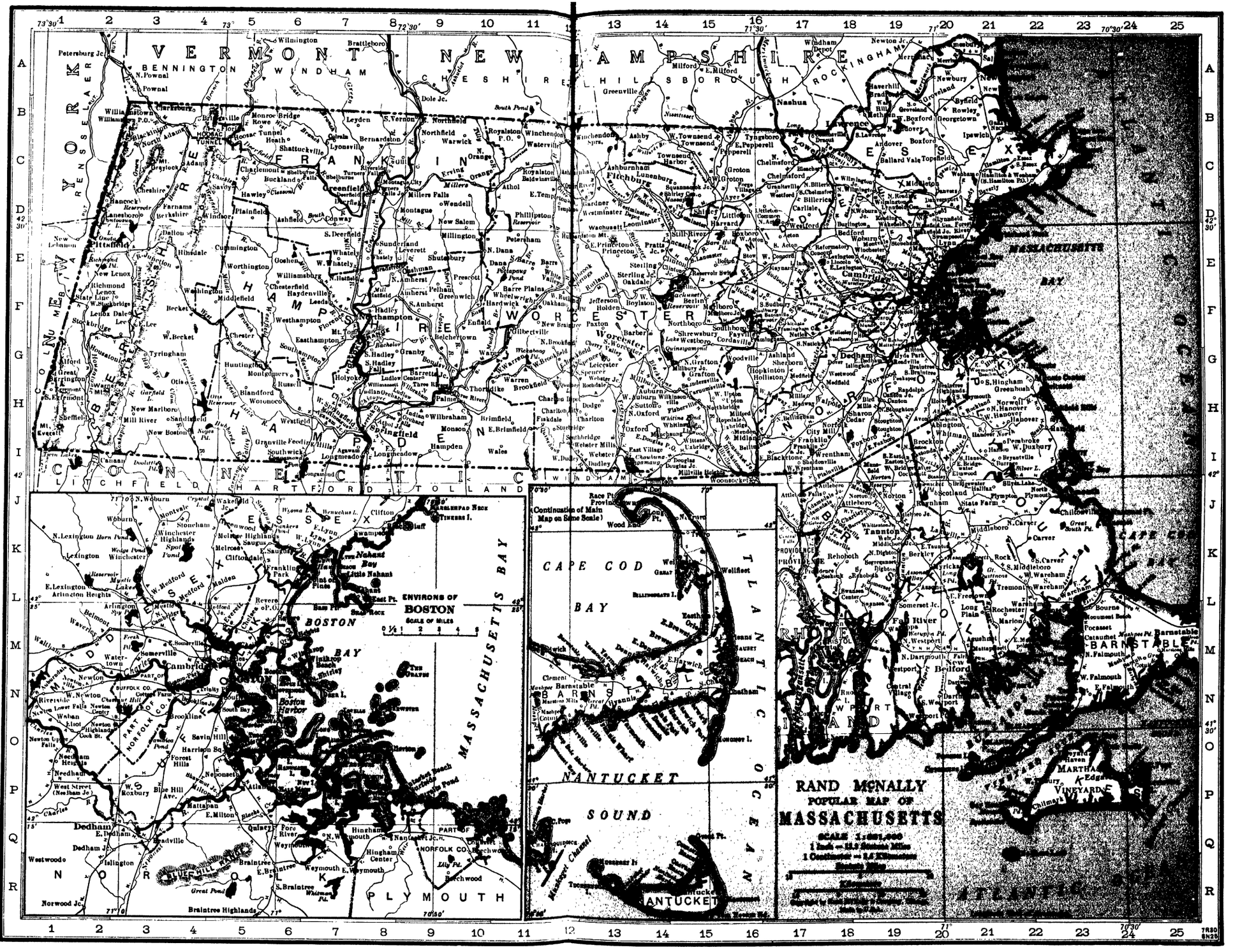
MASSACHUSETTS

Area 8,266 sq. m.
Pop. 4,249,614

PRINCIPAL CITIES

Pop.—Thousands

13 Adams....C 4
7 Agawam....I 7
12 Amesbury..A 20
10 Andover...C 19
36 Arlington..E 18
11 Athol.....C 10
22 Attleboro..J 17
7 BarnstableM 25
22 Belmont...E 18
25 Beverly....C 21
781 Boston...F 20
16 Braintree..G 20
9 BridgewaterJ20
64 Brockton...J 20
47 Brookline..F 19
114 CambridgeE18
7 Chelmsford(C 17
46 Chelsea....E 19
44 Chicopee...H 7
17 ChicopeeFs.H 8
13 Clinton....E 14
8 Concord....E 17
13 Danvers....C 20
9 DartmouthN 20
15 Dedham....G 18
7 Dracut.....C 17
11 EasthamptonG6
48 Everett....E 19
11 Fairhaven.M 20
115 Fall RiverM 19
41 Fitchburg..C 13
22 Framingham G 16
7 Franklin...I 17
19 Gardner...D 13
24 Gloucester.C 23
7 Grafton....G 15
16 Greenfield..C 7
49 Haverhill..A 19
7 Hingham...G 21
57 Holyoke....G 7
8 Hudson....F 16
7 Indian Orch.H 8
85 Lawrence...B 18
22 Leominster.D14
9 Lexington..E 18
100 Lowell....C 17
9 Ludlow....H 8
102 Lynn.....E 20
58 Malden....E 19
9 MarbleheadD21
16 Marlboro..F 15
7 Maynard...E 17
60 Medford...E 19
23 Melrose....E 20
21 Methuen...B 19
9 Middleboro.J21
15 Milford...H 16
7 Millbury...G 14
16 Milton....G 19
8 Montague...D 8
14 Natick....F 17
11 Needham...G 18
113 New Bedford M 20
15 Newburyport A 21
65 Newton....E 18
22 N. Adams..B 3
24 NorthamptonF8
7 N. AndoverB19
10 N.AttleboroJ 18
10 NorthbridgeH15
15 Norwood...G 19
10 Palmer....H 9
21 Peabody...D 20
50 Pittsfield...E 2
13 Plymouth..J 23
72 Quincy....G 20
7 Randolph..H 19
10 Reading...D 19
36 Revere....E 20
8 Rockland..H 21
43 Salem.....D 21
15 Saugus.....K 5
7 ShrewsburyF15
104 SomervilleF10
14 Southbridge12
7 S. Hadley...G 8
150 Springfield.H8
10 Stoneham..E 19
8 Stoughton.H 19
10 SwampscottD20
37 Taunton...K 19
16 Wakefield..D 19
7 Walpole...H 18
39 Waltham...E 18
7 Ware.....I 10
35 Watertown.M 2
13 Webster....I 13
11 Wellesley...F 17
20 Westfield...H 6
10 W.Newton F 18
17 West Springfield.....H 7
21 Weymouth..G 20
8 Whitman..H 20
13 WinchesterK 18
17 Winthrop..M 6
19 Woburn...D 18
195 Worcester.G 13



amounted to $15,662,329. Among the agricultural products are wheat and corn. Ten miles south of Massillon is the site of the first cabin erected in Ohio by a white man, when Moravian missionaries from Pennsylvania made a settlement.

The village was founded by James Duncan in 1826, and was laid out and named for James Baptiste Massillon the next year. In 1853 Massillon became incorporated as a village and in 1868 was made a city. Pop. 1920, 17,428; 1930, 26,400.

MASSINGER, PHILIP (1583-1640), English dramatist, was baptized at St. Thomas's, Salisbury, Nov. 24, 1583. He studied at Oxford from 1602 to 1606, then joined the dramatic poets writing for Henslowe. After Beaumont's marriage he collaborated with JOHN FLETCHER, and on Henslowe's death in 1616, wrote with Fletcher for the King's Men. Massinger was frankly a follower of Shakespeare's, but is rhetorical rather than poetic. From internal evidence of his works he is supposed to have been a Catholic. His greatest creation, still the actor's favorite, was Sir Giles Overreach, in *A New Way to Pay Old Debts,* c. 1625. His comedy, *The City Madame,* is one of the first achievements in the comedy of manners. Massinger died near the Globe Theatre and was buried next to Fletcher in St. Saviour's, Southwark, Mar. 18, 1640.

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MASSIVE, MOUNT, a lofty Rocky Mountain peak in Lake Co., Colorado, having an elevation of 14,404 ft. above sea level. It is found in the Sawatch range which has the highest peaks of the Rockies in the United States. The eastern slope rises abruptly from the valley of the Arkansas River and is deeply carved with cirques by former glacial streams. This formation is similar to that of Mt. Elbert, just south, which is the highest Colorado mountain.

MASS PRODUCTION. *See* PRODUCTION, INTERCHANGEABLE.

MASS PRODUCTION, CONVEYORS IN. *See* CONVEYORS IN MASS PRODUCTION.

MASTER AND SERVANT, the COMMON LAW term for the relation of employer and employee. The incidents of this relation to-day are largely governed by statutes, as, for instance, the so-called truck acts prohibiting payment of wages in orders on company stores, so-called factory acts, setting up regulations with respect to conditions of labor, safety appliance acts requiring certain appliances for the protection of employees against accident, and employer's liability, or workmen's compensation acts, imposing certain liabilities upon employers in case of injuries to workmen in course of employment without regard to fault of the employer. In England and in many other parts of the world there are minimum wage laws regulating to some extent the wages in certain employments, but these acts are held unconstitutional in the United States.

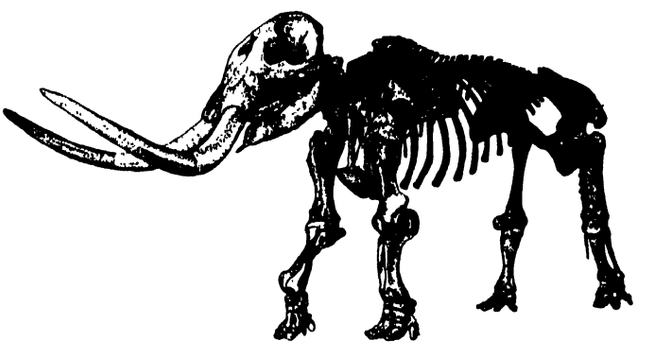
MASTER IN CHANCERY. *See* CHANCERY, MASTER IN.

MASTER OSCILLATOR, an oscillator (*see* OSCILLATOR, ELECTRIC) of small power output used to feed high-frequency carrier currents to a power amplifier. *See also* RADIO COMMUNICATION.

MASTERS, EDGAR LEE (1869-), American poet and novelist, was born at Garnett, Kan., Aug. 23, 1869. He was educated at Knox College, and in 1891 was admitted to the Bar. His first poetry, *A Book of Verses,* 1898, was followed by *Maximilian,* a drama in blank verse, and *The New Star Chamber,* a book of essays, in 1904. In 1915 Masters wrote *The Spoon River Anthology,* a book of ironic epitaphs in verse, which had widespread popularity. *Selected Poems* appeared in 1925. Among his several novels, *Mitch Miller,* 1920, is perhaps outstanding. Master's other works include *Lee,* 1926, *Jack Kelso,* 1928, *Lincoln the Man,* 1931.

MASTERWORT, a name given to various plants of the parsley family. The imperial masterwort (*Imperatoria Ostruthium*), native to Europe and sparingly naturalized from Newfoundland to Michigan, grows 2 to 5 ft. high with a stout hollow stem bearing leaves divided in threes and numerous white flowers in compound umbels. In Europe the plant was formerly grown as a potherb and used extensively in domestic medicine. The smooth masterwort (*Astrantia major*), a low, tufted perennial native to Europe, bearing numerous clusters of pink or white flowers, is commonly cultivated as a border plant.

MASTIC TREE (*Pistacia Lentiscus*), a small evergreen tree or shrub of the cashew family yielding the resinous gum known as mastic. It is a native of Mediterranean countries grown commercially mainly on the island of Chios. The gum, which exudes and hardens in pale yellow, transparent drops from incisions made in the bark, has a bitterish taste and an aromatic odor. Although formerly prized medicinally, mastic is now chiefly utilized as an ingredient in varnishes. It is also used to some extent, especially in Turkey and Arabia, as a chewing gum or masticatory, whence the name mastic.

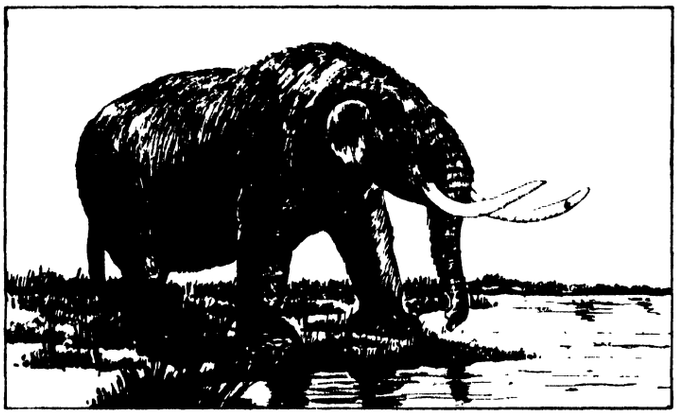


COURTESY AMER. MUS. OF NATL. HISTORY

MASTODON (*M. americanus*), SKELETON

MASTODON, an extinct elephant-like mammal, which vanished at the close of the Ice Age, found fossil in most countries of the globe. Mastodons are sharply distinguished from the mammoths and the

true elephants of to-day in possessing peculiar nipple-teeth, crested with conical cusps, and elongated under-jaws. In appearance they resembled modern elephants, but were more massively built, with shorter legs and flatter foreheads. Of 30 recognized species the best known is *M. americanus,* which figured conspicuously in the fauna of the United States and Canada a few thousand years ago. Although probably never equal in size to a mature African elephant, this animal stood 9 ft. to 9 ft. 6 in. at the shoulder,



COURTESY AMER MUS OF NATL HISTORY

MASTODON (*Mastodon americanus*)
From a painting by Charles R. Knight

wore a coat of woolly brown hair, and brandished strongly curved tusks averaging 7 to 8 ft. long.

Mastodon remains are most common in the Ohio and Hudson valleys, though extensive deposits occur at Bone Lick, Ky., and Kimmswick, near St. Louis. More than 100 skeletons have been taken from swamps in Ulster and Orange counties, New York. Many mounted skeletons and also a life-size restoration at Albany are exhibited in American museums. Evidence points to a brief contemporary existence in North America of mastodons and primitive man.

MASTOID AND MASTOIDITIS. Mastoid Process. The mastoid process is a bony prominence situated in back of the ear. It is not present at birth and in the early years of childhood it is quite small. Surrounded by a hard shell or cortex of bone, its interior makeup may best be described as resembling a honeycomb. In some people the cells of this honeycomb are large, in others they are quite small and in some instances they are almost entirely absent, their place being taken by bone of an ivory hard texture. When well developed, the cells of the mastoid may spread in many directions coming into intimate contact with vital structures such as the brain and important blood vessels.

The mastoid cells communicate with one another and by way of one cell, usually large and practically always present, they connect with the tympanic or middle ear cavity.

Mastoiditis is inflammation of the mastoid cells. This inflammation may be relatively of short duration and hence is termed acute; or it may be of many months or years standing and therefore is chronic.

The acute types are those most common in people's experience. They are nearly always secondary to an abscess of the middle ear and are apt to occur in the course of the latter disease when this complicates such illnesses as influenza, measles and scarlet fever.

At first the signs of mastoid inflammation cannot easily be separated from those of middle ear abscess. There is always a mild mastoid involvement in every instance of middle ear abscess, but at the end of the first week this usually clears up. When, however, pain in and back of the ear persists into the second and third week, accompanied by fever, profuse discharge from the ear, headache and pain on pressure over the bone back of the ear, then the physician recognizes involvement of the mastoid process which may require surgical operation.

Even with the signs and symptoms described many of those who suffer recover spontaneously.

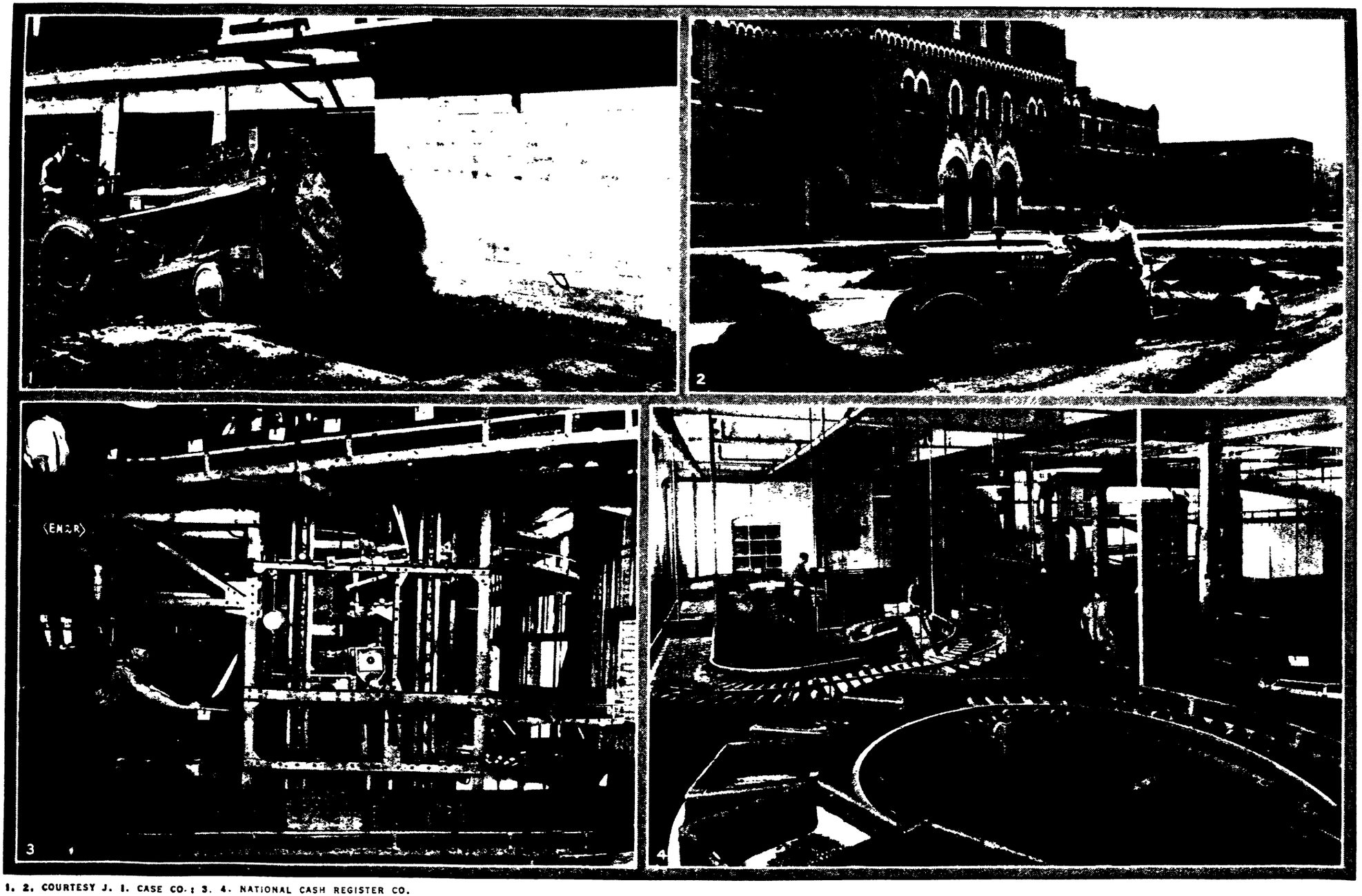
Operation when required consists in removing the hard outer shell of the mastoid process and clearing out the soft, broken down and infected bony structure of the interior. Barring complications, practically all cases of mastoiditis should get well, with the middle ear becoming dry and the hearing normal or practically so.

Because of its relations to important neighboring structures diseases of the mastoid bone on occasion are complicated by dire disturbances of the brain and its coverings, as well as by sepsis or blood poisoning. The prevention of these unwelcome complications is highly important and usually may be prevented by the judicious choice of time of operation. Their treatment demands all of the skill and judgment modern medicine and surgery can afford. S. J. P.

MASURIUM, a metallic chemical element belonging to the same group as manganese, having the symbol Ma and atomic weight probably about 98. Its existence as an element was shown by spectroscopic methods in 1925 by Noddock and Tacke.

MATANZAS, the capital city of Matanzas Province, Cuba, on Matanzas Bay on the north coast about 56 mi. southeast of Havana. It is connected with that city by a good highway, an electric line and a railway. Interesting features are a lighthouse, on a tower 62 ft. high which throws light 13 mi. outward, the limestone Bellamar Cave 3 mi. distant, and the Pan de Matanzas, a knoll rising 1,000 ft. above the wooded slope on which the town lies. The Paseo de Marti is a famous drive which follows the harbor. At one end is a statue of Ferdinand VII, and at the other a memorial to Cuban heroes. The San Juan and the Yumurí rivers flow through the city. It is one of the centers of the sugar industry of Cuba. It was founded in 1693 and is the birthplace of Gabriel de la Concepcion, who was executed here for sedition. Est. pop. 1930, 46,717.

MATE (*Ilex paraguariensis*), called also Paraguay tea, an evergreen shrub or small tree closely allied to the holly, highly valued as a beverage plant. It is a native of Paraguay and southern Brazil where it is also cultivated. The dried leaves and shoots, gathered from both wild and cultivated trees at intervals of



1, 2. COURTESY J. I. CASE CO.; 3, 4. NATIONAL CASH REGISTER CO.

MODERN METHODS OF HANDLING MATERIALS

1. Moving coal with a tractor-operated shovel. **2.** Pneumatic-tired tractor moving earth for fill.
3. Vertical conveyors which handle 2,500,000 boxes of metal stock per year. **4.** Gravity-operated, horizontal conveyors of the roller type.

about three years, are widely used in South American countries for making the tealike beverage called maté. In Paraguay and in the southern parts of Brazil maté grows in abundance, often forming pure stands of considerable extent. The quality of maté depends upon the methods used in the drying and preparation of the leaves. In general the leaves are dried over a fire, reduced to a powder by pounding on a hard floor and then made into packages for the market. Many million pounds are shipped annually from Paraguay and Brazil to other parts of South America. Maté owes its refreshing and stimulating qualities to caffein which is present in the leaves though in smaller quantities than in tea and coffee.

MATERIAL HANDLING, a term covering every type of apparatus and method used in moving and storing materials, from the hand truck, which replaced the wheelbarrow, to the huge overhead *crane* that will lift a locomotive. The term also includes storage bins, both movable and stationary, and methods of dispatching material from one department to another. *See* CONVEYORS IN MASS PRODUCTION.

The type of handling equipment used depends on the nature of the material and whether it is moved only from one machine to another, or from department to department. Continuously moving conveyors—either belts, chains or platforms—are used largely in mass production. *See* PRODUCTION, INTERCHANGEABLE. In some cases the conveyor goes through and forms part of the machine itself, but in others the work is lifted from the conveyor to the machine; in still others, used in ASSEMBLING, painting or testing, the work is performed on the moving conveyor. Overhead and gravity conveyors are widely used in some plants to keep the material off the floor and in transit until wanted, thus saving floor space by storing material in the air. Automatic elevators also carry boxes of materials from one floor to another, taking the boxes directly from one conveyor and delivering them to another. Spiral gravity conveyors give a slow movement of the work from one level to another. Many boxes may be stored on them.

Conveyor lines are used in assembling machinery irrespective of its size, small radio parts and the largest automobiles both being assembled similarly. Such conveyor lines may be: Fully automatic; Controlled by individual operators; or By the head of a department. For small work they are built into the assembling or work benches; for large work they are placed at about the floor level. In some automobile assembly lines, the conveyor automatically turns the chassis over at the proper point in the line. When properly designed and installed they are an important factor in securing economical production. F. H. C.

MATERIALISM, a philosophy holding that the ultimate nature of things can be reduced to matter and motion. All forms of consciousness, thoughts, feelings and volitions are but manifestations of matter; they are rarefied matter. "Give me matter and motion, and I will make the universe" expresses well the materialistic ambition.

DEMOCRITUS has often been regarded as the founder of the Materialistic School (420 B.C). It was he who developed the atomism of Leucippus into a systematic materialism. The Epicureans (*see* EPICUREANISM) were influenced by Democritus in their metaphysical conceptions. THOMAS HOBBES (1588-1679), in his doctrine of body, developed a thoroughgoing materialism. Hobbes gave to his conception of body the properties of extension and motion. In France materialism came into popularity during the 18th century, and was best represented by La Mettrie in his well-known book *Man A Machine.* Vogt, in Germany, gave expression to materialism in its most extreme form in the doctrine that "Man is what he eats," *Mann ist was er isst.* In recent years a modified form of materialism has been ardently championed in the monumental work of ERNST HAECKEL.

The age-old conflict between materialism and idealism has been abated somewhat by the newer developments in physics and chemistry. The electron theory on the one hand, and the newer approaches to psychology on the other, have done much to bring these contending schools together.

MATERIALIZATION, the appearance of a human figure in a spiritualistic seance, often that of a deceased person recognized by a sitter. In the earliest stages of the American revival of SPIRITUALISM (1848), the chief phenomena were messages by rappings, sounds and touches in the dark, as well as messages by the voice of the entranced medium, and the appearance in the dark of ghost-like forms. By 1860 or 1870 complete figures appeared in the medium's cabinet or walked about among sitters.

In spirit theory this was a materialization which in turn vanished into the spirit world. Crude, fraudulent impersonations by the aid of wigs and draperies were often exposed. It was this phenomenon that a half-century later gave rise to the elaborate theory of ECTOPLASM.

MATERIALS TESTING has two purposes: To determine if a given material measures up to its requirements; and to determine data or characteristics. The first type is normally known as INSPECTION and the latter as RESEARCH. Much of the former is done by government bureaus or commercial laboratories, while research work is largely carried out by government bureaus, industrial research laboratories and various universities. People interested in certain materials financially assist the government bureaus and the universities in carrying on their studies. In order that tests may be performed in any laboratory, standard specifications for the apparatus to be used and the procedure to be followed have been adopted by the AMERICAN SOCIETY FOR TESTING MATERIALS and by the AMERICAN STANDARDS ASSOCIATION. Testing equipment may be sent to the BUREAU OF STANDARDS for calibration to meet any particular specification. In the case of cement testing, the bureau has field men who check up in the field on laboratories to see that their equipment and methods are correct. Certain materials are affected by changes in temperature or

changes in relative humidity, while others, as Portland cement products, are also affected by age (*see* TIME, EFFECTS OF), so that considerable care must be exercised in order not to have these and other items affect the results. E. E. B.

MATERNAL AND INFANT WELFARE. For many years, eugenists have urged physical examination before marriage as a means of preventing the development of mentally defective people and of protecting the healthful person against the infected one. Blood tests are necessary and more complete examinations are called for when the blood tests indicate their importance. In some countries special clinics have been developed for making physical examinations before marriage and for providing suitable certificates.

Although general mortality rates have dropped steadily for many years, infant mortality rates have not always kept pace. Among the factors concerned in controlling infant mortality are constant emphasis on the necessity of breast feeding of babies and widespread education of mothers.

With the understanding of the importance of beginning care of the prospective mother well in advance of the time when the child is to be born, it is possible for her to undergo childbirth with less difficulty and with less danger than ever before.

The family doctor should be consulted from the first and should care for her until after the child is born. A careful physical examination made early will permit the proper care of the teeth, the control of infections, the establishment of knowledge as to what is a normal blood pressure and a study of the heart and lungs which is absolutely necessary for safety.

It is important to watch particularly the action of the kidneys because the first signs of danger from poisons, sometimes associated with childbirth, reveal themselves in the excretion of the kidneys.

The mother should determine very early whether or not she expects to have the child in the hospital or at home. If the child is to be born at home, it will be necessary to provide certain equipment which is of the greatest importance in the prevention of infection and in the proper care of the mother during childbirth. If she is to have the child in a hospital —more and more babies are being born in hospitals— it will be necessary to arrange for suitable accommodations well in advance.

If a woman is in good health and in the early months of the process of childbirth, there is no reason why her diet should be changed. She should eat simple, easily digested food, consisting largely of fruit, leafy vegetables, cereals with milk, cream and butter and a little meat. The old superstition that a prospective mother must eat for two, is erroneous. Overeating throws too great a burden on the already strained system. It must be made sure, however, that the diet contains a sufficient amount of food for her activities and enough of the important body-building substances to meet both her needs and those of the child.

Meat, fish, fowl and eggs are almost wholly protein in character. These substances have great structural value, but they also tend to throw special burdens on the kidneys. The physician will therefore limit the amount of protein substances that the expectant mother should have, telling her that she should not eat more than four ounces of meat, fish, fowl or eggs in any one day, or more than four ounces of any combination.

Sugars and starches, such as make up the bulk of rice, potatoes and bread, take the place of proteins, but have the disadvantage of causing acid unless properly prepared. Rich pastries and foods fried in deep fats are sometimes indigestible.

Large quantities of fluid are needed. The mother may take eight or ten glasses of water a day, and at least a quart of milk. Coffee and tea may be taken according to the habits of the mother. Alcohol should not be taken during this period, because there is good evidence both from the laboratories and from medical practice that alcohol is a specific poison for the developing child.

The woman should take outdoor exercise without getting too tired. The nearer the day when the child is to be born, the more likely she is to become tired soon and require more rest. When out walking, her shoes should be broad, with low heels and wide toes, because high-heeled shoes may cause backaches and slip more easily, with the possibility of accident. She may do the usual housework, but never carry on any physical activity to the point at which she is worn out. Sewing on a machine that requires the constant use of the foot for its operation should not be done. The prospective mother should sleep a little longer at night, and, if possible, take a brief nap during the day. The physician will instruct her as to the proper steps to be taken to avoid constipation.

The prospective mother should bathe her whole body with warm water every day, and should avoid hot or cold baths. It probably is best not to take tub baths during the last four weeks before the child is born. Shower or sponge baths are recommended.

Any dental work necessary to preserve the teeth should be done during the early months, but big jobs of reconstructive dentistry should not be undertaken. Infections of the mouth should be cleared up and teeth with abscesses at the roots extracted. The danger to the prospective mother and to the child from infections at the root of the teeth are greater than any dangers associated with removal of the teeth during the early months.

There is much foolish advice given as to the value of massage during this period, the claim being made that it will avoid scarring and preserve the figure. Massage is unnecessary and may be exceedingly dangerous. It should be permitted only on the advice of a physician and under his direction.

Most of the troubles of the early months when a child is to be born are the result of the absorption by the body of the mother of certain by-products of the developing child. Associated with this absorption of poisons is an upset stomach, producing a morning nausea sometimes so severe as to produce definite

illness. Headache is often a symptom, with dizziness, especially when there is no food in the stomach.

Under such conditions, women frequently lose their interest in food and develop unusual food cravings. Sometimes certain odors will excite the most severe nausea and the woman will develop an antipathy to the odor of tobacco, of fish, of perfumes, etc. Sometimes, associated with this, there is an unusually large amount of saliva. In many instances the mother will feel better if, in the morning, she can take a cup of hot coffee with two crackers, or some dry toast before getting out of bed, indeed, without lifting her head from the pillow. After this meal, she remains in bed for an hour and then gets up for breakfast. An irritable stomach will tolerate a dry meal when liquids will provoke vomiting. The foods selected should therefore be largely dry during the breakfast period. Liquids may be taken freely between meals, and cold liquids are better tolerated than warm. In extreme cases the physician will withdraw all food for twenty-four hours or more, and will modify the diet to meet the physical condition of the patient as determined by his examination.

The mother's loss of appetite should not be permitted to interfere with the development of the child or her own body. It is normal for her to gain some weight during the early months of the process. It is necessary for her to have definite amounts of specific food substances in order to protect her own body and to assure the growth of the child. There has been much argument both among physicians and the public as to whether it is possible to restrict the size of the child by cutting down the mother's diet. Even the most careful investigations have failed to establish the possibility that the child's size may be greatly restricted through such measures. On the other hand, both the mother and the child require certain amounts of specific food substances if they are to remain healthy and strong. If the mother tends to take on an excess of weight during the process of the child's growth, it is better to limit the amount of food eaten and to increase the amount of exercise rather than to eliminate the sugars and starches entirely from the diet.

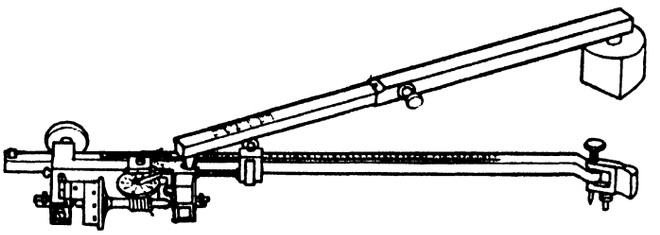
When the child is born it constitutes from the very first moment a problem to which everyone of the specialists concerned must give attention. Proper nutrition may mean the avoidance of innumerable diseases. Nursing by the mother gives to the infant not only the energy values of food, but also substances concerned with resistance to disease. Artificial feeding is successful in many cases—indeed, in some instances more successful than feeding by the breast. But the vast majority of babies still thrive better on human milk and it is important that they have this lacteal fluid, as one might say, their constitutional right.

The behaviorists have discovered that habit formation begins very early in life. The child cries because it wants attention. If the parents yield to the cry, the demand for attention becomes a habit. The child learns remarkably quickly how easily it can dominate its fond parents, and, like all tyrants, it loves to exercise its power. *See also* OBSTETRICS; VARICOSE VEINS.

M. F.

MATHEMATICAL INSTRUMENTS. The growth of mechanical aids to computation has been very rapid in recent years. There have been devised instruments for measuring areas, referred to below under planimeter; those for integration, also described below; those for tracing the integral curve from a differential curve, the integraph; those for predicting tides, and others for solving equations and for computations of various kinds (*see* CALCULATING MACHINES), for approximately trisecting angles, and so on as required by computers, draftsmen, architects, navigators and others having similar needs. The following descriptions relate to a few of the most important devices:

Mechanical Integration. Finding the area under a curve is equivalent to the problem of evaluating the definite integral $\int_b^a y\,dx$. In many cases it is impossible to find an exact or approximate equation for the curve. An instrument used for finding such areas is called a planimeter. The area swept over by a line of constant length is expressible in terms of the length of the line, the circumference of a wheel on which the



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POLAR PLANIMETER

line rolls, and the number of revolutions of the wheel. If the point traces a closed curve, negative rotation annuls positive rotation, leaving the excess as the area bounded by the curve. The sliding component of the motion of the wheel is not registered. A line of constant length, when connected by a pin joint to another bar having an end as an anchored point, forms a polar planimeter, the invention of Jacob Amsler (1856), and is one of the most popular types of planimeter. If, instead of a bar, or polar arm, swinging about a point, the bar carries two wheels which run in a straight slot, the instrument is a polar planimeter with an infinitely long polar arm. The earlier form of the planimeter, due to Gonella (1824), and Oppikoffer (1827), was based on a wheel rolling on a cone, the amount of rotation being greater as the wheel moved away from the vertex of the cone. Later forms replaced the cone by a circular disk, the amount of rotation being dependent on the distance of the disk from the center of the circle.

Integrometers. One development of the planimeter is the integrometer, or integrator, of Amsler,

which in addition to evaluating $\int y\,dx$, carries wheels which enable $\int y^2\,dx$, $\int y^3\,dx$, and $\int y^4\,dx$ to be evaluated, giving centers of gravity and moments of inertia.

Integraphs. An instrument for tracing one of the integral curves from a given differential curve is called an integraph. It was invented by Abdank-Abakanowicz (1878). A vertical tracing wheel in a plane of the tangent to the integral curve is made to move so that it has a slope proportional to the ordinate of the given curve.

A machine which integrates a result of the first integration has been devised by Prof. Vannevar Bush at the Massachusetts Institute of Technology. As the pointer moves up and down along a curve, the electrical power flowing through a meter varies. The motor in turn drives another pencil which traces the integral curve. A second integrating device gives the second integral directly.

Harmonic Analyzers. A periodic function may be expanded as a Fourier series, breaking up the curve into simple component curves. If the equation is known, the problem of calculating the coefficients may be solved by the integral calculus. Machines which determine the coefficients, if the periodic curve is known, are called harmonic analyzers and are due to Kelvin (1876) and Henrici (1894).

Harmonic Integrators. Such machines reverse the problem and produce a complex harmonic motion by the combination of simple harmonic motions. *See* SEXTANT; HYPSOMETER; CLINOMETER. L. L. L.

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MATHEMATICAL MODELS, any physical representations of relationship between various elements in a mathematical investigation. The conception of a mathematical model as merely a geometric one,—*i.e.*, as pertaining only to geometry,—is erroneous. Models of the arrangement of atoms in a molecule, of the possible orbits of electrons in an atom, or of the solar system, or models for demonstrating an algebraic law may be classified as mathematical models.

The purpose of mathematical models is to give physical representations of mathematical relationships which are expressed in purely abstract forms. The mathematical model serves the purpose of visualization of a general mathematical statement in some particular case from which, by mere intuition or if possible by mathematical reasoning, the general relationship can be derived. Hence, the first requirement imposed on a model is that it be clear in the illustration of the mathematical principles; the second, that it be simple; and the third, which embraces the first two, that it should induce visualization.

Mathematical models have been employed in teaching since the first inception of mathematics. The early Greek geometers resorted to drawings on sand, which can be considered as geometric models in a general sense. Although mathematical models became popular in the schools of the United States in the beginning of this century, the actual use of such models in daily instruction in the classroom had been more favored in the schools of Western European countries.

The use of geometric models in classroom instruction involves a threefold purpose. In early stages the child becomes acquainted with various geometric forms, both two and three dimensional. At more advanced stages he studies the geometric relationships from an appropriate model, or is led to see a physical law expressed in mathematical terms. Finally, the pupil either constructs a model, or makes a drawing of a geometric relationship from a displayed model. In each of these stages the model enhances the importance of visualization in the learning process.

The most commonly used geometric models are wooden ones representing either two or three dimensional figures. Their disadvantage in representing SOLIDS is due to opacity, which however can be avoided by using string, wire, or glass models. The disadvantage of string models is due to the absence of planes or surfaces, which have to be imagined by the pupil. Glass models have the advantage of transparency, but the main hindrance to their development lies in the fact that the construction of more complicated models is hampered by the brittleness of the medium. Celluloid and cellophane models are not favored because these materials are very sensitive to temperature and humidity, and this brings about the distortion of the shape of the models. Other models are made of wires and colored wire screens. Due to their construction and the materials used, the above disadvantages have been eliminated.

The most complete collection of string models was made by H. Wiener and P. Treutlein in 1907. They are manufactured by B. G. Teubner in Leipzig, Germany. A large number of glass models known as Yale, or Fisher, models were constructed by Prof. Irving Fisher of Yale University. Wooden models are manufactured by many school supply concerns.

A. B.

MATHEMATICS, a term of which the precise significance has been the subject of frequent change, signifies in general the science of space and number. The word comes from the Greek root *math,* meaning learn, whence *mathēma,* science, and seems to have originally covered science in general as distinguished from philosophy and letters. In early times it included the study of stars, astrology and astronomy; the mystery of numbers, whence the later theory of numbers; the study of forms, triangles, circles, cubes and the like; and, beginning apparently about the 6th century B.C., the study of music as a science. The inclusion of music seems to have come from the discovery by PYTHAGORAS that a musical tone depends on the length and tension of a stretched cord, the Greek work *tonos* meaning a thing stretched, from *teinō,* stretch, a word found also in *hypotenuse,* under-

stretched, formerly the base of the conventional right triangle.

Although mathematics seems, as the origin of the word shows, to have been originally synonymous with science, and although it is commonly spoken of as one of its branches, a distinction between the two has often been made. For example, it has been asserted that science is concerned with relations between phenomena, while mathematics considers the relations between quantities, and Prof. Keyser has in *Pastures of Wonder,* 1929, devoted a carefully wrought-out volume to showing much more clearly the essential difference between these two great branches of knowledge.

FOUNDATIONS

The subject is closely related to Logic, one quasi-definition being that it is the science which says "If *A,* then *B;*" that is, if "that" proposition, e.g., one relating to a triangle, is true, then "this" one must be true. Taken in the abstract, unrelated to any practical applications, mathematics constantly advances by means of proofs in which logic enters at every step. In order to make this use of logic, it becomes necessary to lay foundations upon which to build. These foundations are chiefly assumptions of the truth of statements so elementary that no simpler statements can be found upon which to base them. They may be true or they may be false, or in some circumstances true and in other circumstances false. With this mathematics is not directly concerned. (*See* Axioms; Postulates). What it is concerned with is this: *If* statement *A is* true, what conclusion, if any, can be drawn as to statement *B*?

Mathematics finds a further foundation in its definitions. To know that two angles of an isosceles triangle are equal it is first necessary to know what we mean by triangle and then by isosceles. These terms are readily defined. We say that the triangle has three sides, and the word sides is easily defined. We say that each side is a straight line, but straight line is not so simple a term; indeed, it is not possible to give a satisfactory definition of the term without using other terms that are as difficult to define as this one. The same is true of such other terms as angle, point, plane, and space. We may explain the meaning, but a definition involving only simpler terms is impossible. In any finite vocabulary some term must be simpler than, or as simple as, any other term. As with other assumptions, therefore, we must be content to accept certain terms as known or explainable, and assume that a scientific definition is unnecessary.

In general, mathematics has found a danger in attempting precise definitions, since as the subject expands it becomes necessary to change the meanings of terms, a process leading to confusion. For example, multiplication was, in its primitive sense, the operation of taking one number as many times as there are units in another. In this case "times" was intended to mean a positive integral number of times, it being impossible to look out of a window two-thirds of a time or -7 times. It was therefore necessary to broaden the meaning of the two words, multiplication and times, to meet such cases as $2\frac{1}{2} \times 3\frac{1}{4}$, $\sqrt{2} \times \sqrt{-3}$, and $\pi \times (2 - \sqrt{-5})$. Similarly, an exponent was at one time a number which showed how many times another number was taken as a factor, but the definition ceased to have any meaning when the exponent was $\frac{3}{4}$, $-\sqrt{2}$, or $2 + \sqrt{-1}$, although the theory of exponents continued in force.

In the same way trouble arises with such a term as factor. If we define it by saying that a factor of a number is any number which divides it, as in the case of 3 being a factor of 6, the question arises as to whether $1\frac{1}{2}$, -2, and 6 are also factors; whether, because $6 \div 5 = \frac{6}{5}$, 5 is a factor of 6, and so on. If we limit the term to positive integers, we are then confronted by the impossibility of solving certain algebraic equations by factoring, such as $x^2 - \frac{1}{4} = 0$, when it is evident that they are easily so solved.

The remedy is to accept rigid definitions as only temporarily valid and as subject to expansion to meet any new conditions as may render it necessary.

In the same way, mathematics has had trouble with its other foundations. It is, of course, incorrect to make the general statement that from a point on a line only one perpendicular can be drawn to the line, unless it is understood that only a space of two dimensions is considered. Likewise the commutative law, that $a + b + c = a + c + b = \cdots$, and $abc = acb = \cdots$ delayed the invention of quaternions until it was seen that it was not necessarily universal. In the same way the distributive law of multiplication, which asserts that $a(b + c) = ab + ac$ might have to be abandoned under conditions not envisaged when the law was first stated.

Methods Employed. Mathematics finds its way by intuition and the play of imagination; it proves that its progress is certain by means of logical demonstration. Long before the proposition was demonstrated it was known that the sum of the squares on the two sides of a right triangle, at least in certain special cases, was equal to the square on the hypotenuse, this being found intuitively by observing certain forms. What mathematics did, possibly in the school of Pythagoras, was to prove that this is always true in the kind of plane surface that was assumed to exist.

The two general methods of proof may be classed as direct and indirect. The direct method says that if A is true, and A implies B, then B is true. The indirect method says that, for example, if we have two straight-line segments, A and B, then $A = B$, or $A > B$, or $A < B$, and if we can prove that A is neither greater nor less than B, then we have excluded all possibilities except that $A = B$. Indirectly, therefore, by the process of exclusion, we have proved this equality. In each of these methods we postulate that the method itself is valid, just as we postulate that a straight line segment is the shortest path between any two given points.

General Divisions. The number of divisions of mathematics is large; it grows as the subject grows, just as the number of branches of a tree may increase as the tree develops. It may be said, looking to past experience, that the number of possible branches may be unlimited, even though some of these branches may be described as mere twigs. In general we may say, however, that mathematics is concerned chiefly (1) with numbers, which may be classified roughly as (a) natural, with the subdivisions of ordinal and cardinal, and (b) artificial, with such subdivisions as negative, fractional, surd, imaginary and transcendental; and (2) with form, leading to various branches of geometry.

We may also look upon mathematics in its symbolic aspect, the symbols being simple numerical forms, algebraic forms, forms used in higher analysis, those representing operations, and in general those which make up the formulas of science and of pure mathematics. It is because of the value and simplicity of these forms that mathematics has been called "the divine shorthand." We may consider the subject in its non-symbolic aspect, as in pure geometry. We may also classify it with respect to its applications,—in general to its use in measuring something, one important branch being trigonometry. These applications have many ramifications as in physics, geodesy, astronomy, navigation, industry and commerce. Under each of these heads there are many subdivisions such as tensor analysis, spectrum analysis, surveying, perspective and relativity, these being discussed elsewhere in this encyclopedia. We may also consider mathematics in its mechanical and non-mechanical aspects, in the former of which the reader may consult MATHEMATICAL INSTRUMENTS, CALCULATING MACHINES, TELESCOPE, and similar articles.

HISTORICAL DEVELOPMENT

The history of the race is, in a sense, the history of mathematics, for the development of this subject has synchronized with the development of human needs, physical or mental. When the race needed to count the members of a tribe or the flocks, the number words developed as a part of language; when it needed to barter, people learned to add, to hold up fingers to represent numbers, and to represent numbers by pebbles or by notches on a stick. To rise higher in the scale, when they watched the motion of the stars in any systematic way, records became necessary and the first steps toward a far-distant science of trigonometry were taken. Thus, little by little human needs, intellectual or mechanical, philosophical or scientific, idealistic or commercial, gave rise to the mathematics which we have to-day and the future will see the subject still further developed as these needs shall make their increasing demands.

The nature of the world's first steps in mathematics is and always will be conjectural. Even the study of savage and semi-savage tribes fails to give us any conclusions beyond the growth of counting to meet the needs of certain primitive people. The earliest documentary evidence that we have, inscriptions on stone or brick, shows that the subject may have had its inception in the Mesopotamian region, in Egypt, in Turkestan, or possibly in India or some other region favorable to the development of barter, as of flints, pottery or clothing, or later of domesticated animals and wool. In any case it is probable that only such numbers as can be represented by the 10 fingers were needed for thousands of years.

The oldest extant evidence of any broader conception of number, as shown in the numerals, dates from about 3500 B.C., and comes from the Sumerians, who then inhabited the land about the head of the Persian Gulf. Their CUNEIFORM inscriptions show the ability to write numbers on a scale of 10, but with a tendency to use 60 as a secondary scale, as we still use it as the minutes in an hour or in a degree. (*See* SEXAGESIMAL FRACTIONS.) The cuneiform writing spread to the north, and we have a large number of tablets from the Babylonian region, with elaborate number records, of the period from 2500 B.C. onward.

The evidence of geometric designs on pottery is, however, considerably earlier, in China extending back into the fourth millennium B.C. Doubtless some kind of number work was equally early, since barter must have kept pace with the productions of the potter's art.

Aside from the use of numbers in trade, and the recognition of simple geometric forms in the plaiting of rush mats and the decoration of pottery and of hides for tents, the first great impetus for developing a higher type of mathematics came from those well-inhabited regions in which the stars shone most brilliantly, such as Egypt, Iraq and India. The mystery of the heavens, the feeling that in the firmament dwelt the gods who decreed the destinies of men, and the belief that the stars recorded these decrees, all this gave rise to the early study of ASTRONOMY and ASTROLOGY, the two interlocked branches which led many centuries later to the development of trigonometry, celestial mechanics, and the theories of the universe which now attract so strongly the attention of the world.

Perhaps in Egypt or in Babylon, as early as the third or fourth millennium B.C., there first developed systems of the measure of land, of the running of irrigation trenches, and of finding the capacity of granaries. Certainly in the second millennium at least two of these systems were well known, as the inscriptions show. From such beginnings there slowly evolved the later methods of carrying water by aqueducts, in which the Romans excelled, and the systems of surveying and of measuring areas and volumes that have come down to us. (*See* MENSURATION; GEODESY.) Even in these early times there may have been some approach to logical proofs of geometric statements, although the first definite evidence of their existence is found in the Greek civilization.

In Egypt, about 1700 B.C., a scribe named Ahmes (A'h-mosè) made a copy of an earlier manuscript on mathematics. This copy is now in the British Mu-

seum. It is the oldest mathematical treatise of any extent that has come down to us practically complete. It contains an elaborate table of unit fractions, a little work on simple types of series, a number of interesting cases of mensuration, and various problems involving the solutions of such linear equations as the one which we would write as $x + \frac{1}{7}x = 19$. This was not, however, the first work of this general nature, for there is evidence of commercial mathematics in papyrus fragments found in Egypt and dating back to the close of the third millennium B.C. In these records we find fairly convenient symbols for writing numbers as high as millions but only crude means for representing algebraic equations.

In the Ionian city of Miletus, on the coast of Asia Minor, there was made, in the 7th century B.C., a great step in advance in the field of mathematics. THALES (c. 640-c. 546 B.C.) seems to have taught, at this time, that geometry is a deductive science, and possibly to have done the same for the theory of numbers. That he obtained some of his knowledge of astronomy from the Chaldeans seems quite certain; how much of his logical treatment of mathematics he obtained from them and from the Egyptians we do not know. In any case, geometry as we now recognize it seems to have come chiefly from him, from his pupil, PYTHAGORAS (c. 572-c. 501 B.C.), and from their Greek successors. Chiefly to Pythagoras and his school we are indebted for the beginning of our theory of numbers.

Elementary geometry among the Greeks reached its highest point in the *Elements* of EUCLID, about 300 B.C. The more advanced subject of conic sections, which had attracted attention for a century or more, attained a similar position in the treatise of Apollonius of Perga (fl.c. 225 B.C.). Thus we find Greece and her colonial city of Alexandria leading the world in the early development of these two fields of geometry.

In the special domain of the mensuration of SOLIDS, a subject somewhat related to natural philosophy, the Greeks also excelled. The leader in this work was ARCHIMEDES (287-212 B.C.), whom Pliny characterized as "the god of mathematics," a phrase which a French translator appropriately rendered as "the Homer of geometry." To his friend ERATOSTHENES (c. 274-c. 194 B.C.) we are indebted for some remarkable work in geodesy, and also for a method, rather crude, of finding PRIME NUMBERS.

In the third century A.D. the subject of algebra, limited however to a certain special type of equations, was further developed by Diophantus. (*See* DIOPHANTINE EQUATIONS; INDETERMINATE EQUATIONS.)

The early mathematics of the Orient is comparatively unknown. The records of the Chinese and Hindus are, as their modern scholars have shown, very unreliable and the claims made by some of their earlier writers are entirely unwarranted. In general it may be said that China never showed any originality in the subject except possibly in indeterminate equations and in problem solving. India probably contributed our common numerals, with the zero, and developed the interesting and fanciful style of problems often found in our algebras. Trigonometry, which had its feeble beginning in Egypt and Greece, made a definite advance in India in the 4th century, possibly influenced by the works of the Greek writers. It certainly took on new vigor among the Arabs in connection with their astronomy and geodesy from the 9th to the 12th centuries, and the scholars of Bagdad were zealous in translating the works of the Greek mathematicians into their own vernacular.

In the 12th century the Arabic translations from the Greek and the original works of the Bagdad school began to be translated into Latin, and the result was a great renaissance of mathematics in Europe. In the 16th century Italy came to the front by her work in algebra, the solution of the cubic and biquadratic equations being effected by Tartaglia, Ferrari and Cardan.

In the 17th century France took the lead, the invention of analytic geometry by Fermat and DESCARTES acting as the greatest single revolutionary power in the entire history of mathematics. The close of that century saw the perfecting of the work of writers like Cavalieri and Roberval through the invention of the calculus by NEWTON and LEIBNIZ. The 18th century saw France still in the lead, particularly in the applications of the calculus to physical problems and to celestial mechanics. The 19th century saw Germany make a great advance largely through the influence of men like Gauss, Möbius, Jacobi, Steiner (of Swiss birth), Riemann and Weierstrass. France, however, was still represented by such powerful leaders as Lagrange (of Italian birth), Laplace, Legendre, Monge, Carnot, Poncelet, Cauchy, Chasles, Galois and Poincaré.

A Synoptic View. Having now considered a few of the most important steps in the progress of mathematics and the conditions which influenced this development, it will assist the reader to take a synoptic view of the subject. In examining the following table it should be understood that the influences suggested are purely conjectural and may easily be extended, that the dates are merely approximate, that the countries are by no means definitive, that the inclusion of all the names of discoverers is impracticable, and that the later applications are also merely fragmentary. In spite of this manifest lack of completeness, the table, which in general is arranged chronologically, will assist the reader in observing the growth of mathematics through the ages. The asterisks (*), generally used with any specific name but once, and relating only to mathematical topics and to individuals, suggest certain collateral topics treated in this encyclopedia.

As to the various branches of mathematics and the leading topics considered in this encyclopedia the reader is referred to the following articles: ALGEBRA; ANALYTIC GEOMETRY; ARITHMETIC; CALCULUS; COMBINATORIAL ANALYSIS; COMPLEX NUMBER; CONICS; CURVES; DECIMALS; DIMENSIONS; DETERMINANTS; DESCRIPTIVE GEOMETRY; DIFFERENTIAL EQUATIONS;

SUBJECT CONSIDERED	POSSIBLE INFLUENCES	PERIODS OF INCEPTION	COUNTRIES FIRST CONCERNED	PROMINENT NAMES	LATER APPLICATIONS
Number names	Barter	Before 4000 B.C.	Egypt, Sumeria		Counting, taxation, trade
Number symbols	Counting, trade	Before 4000 B.C.	Egypt, Sumeria		Taxation, trade, science
Geometric forms	Decoration	Before 4000 B.C.	Egypt, China, Babylonia		Architecture,* geometry *
Calendar *	Shadows, periodic floods, seasons	Before 4000 B.C.	Egypt, Sumeria, China (?), India (?)		Religious festivities, commerce
Astrolatry (star worship)	Mystery of heavens	Before 4000 B.C.	Egypt, Sumeria		Astronomy *
Astronomy * (observational)	Motions of stars, Eclipses	Before 3800 B.C.	Egypt, Babylonia, China (?)		Astrology
(early scientific)	Eclipses	Before 2000 B.C.	Egypt, Babylonia, China (?)		Geodesy,* Navigation *
(later scientific)	Study of Babylonian records	7th century B.C.	Greece	Berosus * Thales *	Meteorology,* navigation
Astrology *	Protection of kings	Before 2000 B.C.	Babylonia		Protection of individuals in general
Currency * (weight of metals)	Inconvenience of barter	Before 2000 B.C.	China		Coins *
(coins)	Inconvenience of weighing	7th century B.C.	China, Asia Minor		Monetary systems
Mensuration	Land and grain measure	Before 2000 B.C.	Egypt, Babylonia		Mensuration in general
Geometry * (elementary demonstrative)	Search for exact truth	600 B.C.	Greece	Thales Pythagoras *	Advanced geometry
Beginning of texts	Needs of students	300 B.C.	Greece	Euclid *	Mensuration
Conics *	Success of elementary geometry	350 B.C.	Greece	Menaechmus *	Astronomy
Scientific texts on conics	Needs of students	225 B.C.	Greece	Apollonius *	Analytic geometry *
Computation By tables	Trade	Before 2200 B.C.	Babylon		Modern tables *
By rods	More rapid computation	Before 500 B.C.	China		Calculating machines *
By pebbles (calculi)		Before 450 B.C.	Egypt		
Our figures		1st century (?) B.C.	India		
By fingers		5th century B.C.	Greece		
		8th century	England	Bede *	
By machinery		17th century	France	Pascal *	
Irrational numbers *	Search for nature of numbers	5th century B.C.	Greece	Pythagoras Democritus * Theodorus *	Mensuration, Number theory
Foundations of mathematics	Search for exact truth	4th century B.C.	Greece	Plato *	Geometry, number theory
Number Theory *	Mystery of numbers	5th century B.C.	Greece	Pythagoras	Advanced theory
Primes		3rd century B.C.	Greece	Eratosthenes	
General		2nd century A.D.	Greece	Nicomachus * Theon of Smyrna *	
Mechanics *	Construction work	3rd century B.C.	Greece	Archimedes *	Engineering
Trigonometry *	Mensuration, astronomy	3rd and 2nd century B.C.	Greece	Aristarchus Hipparchus *	Geodesy, Astronomy

Subject Considered	Possible Influences	Periods of Inception	Countries First Concerned	Prominent Names	Later Applications
Geodesy • (crude)	Land division	Before 3000 B.C.	Egypt, Babylonia		Surveying
(scientific)	Earth measure	3rd century B.C.	Greece, Egypt	Eratosthenes	
Algebra • (primitive)	Puzzle problems	1650 B.C.	Egypt	Ahmes •	Equations •
(geometric)	Quadratic equations •	300 B.C.	Greece	Euclid	
(semi-symbolic)	Indeterminate equations •	275 A.D.	Greece	Diophantus •	
Cubic and biquadratic equation	Progress beyond the quadratic	16th century	Italy	Tartaglia Ferrari • Cardan •	Higher algebra
Modern symbols	Need for better shorthand	16th-17th century	France Germany England	Descartes • Leibniz • Recorde •	Symbolic analysis
Fractions • Sexagesimal •	Measuring	Before 2000 B.C. c. 180 B.C.	Babylon Greece	Hypsicles •	Hours, minutes, etc.
Treatise on		Before 1650 B.C.	Egypt	Ahmes	
Common		7th century	India	Brahmagupta •	Present small fractions
With bar		9th (?) century	Arabia Germany	Rudolff •	Logarithms
Decimal •	Accurate measurements	16th century	Belgium	Stevin •	New currency Metric system
Analytic geometry •	Improved algebra	c. 1637	France	Fermat • Descartes •	
Probability •	Gambling chances, errors in sciences	17th-18th centuries	France Switzerland	Pascal Laplace • Bernoulli	Errors in sciences, Insurance
Calculus	Improved mensuration, Physics	17th century	Italy England Germany	Cavalieri • Newton • Leibniz	Mechanics, Mensuration All sciences
Analysis • (modern)	Improved calculus, Analytics	18th century 19th century	Switzerland Germany	Euler • Bernoulli Gauss •	
Differential equations	Calculus	18th century	France	D'Alembert •	Physics
Function • theory	Calculus, Analytics	18th century	France Norway Germany	Lagrange • Legendre • Abel • Jacobi •	Higher analysis
Theory of numbers •	Translation of Diophantus	17th century 18th-19th century	France Germany	Fermat Gauss	Advanced theory
Geometry • (modern)	Desire to advance from Euclid and Descartes	18th-19th century	France	Carnot •	Projective geometry
Projective •		17th century 19th century	France France	Desargues • Poncelet •	
Descriptive •	Fortifications	18th-19th century	France	Monge •	Engineering construction
Non-Euclidean •	Basal postulates	19th century	Hungary Russia	Bolyai • Lobachevsky •	Higher geometry
Groups •	Theory of equations	19th century	Italy France	Ruffini • Galois •	Higher algebra
Complex numbers	Expansion of number systems	18th century	Norway	Wessel •	Higher number theory
Quaternions	Complex numbers	19th century	Ireland Germany	Hamilton • Grassmann	Physics

ELLIPTIC FUNCTIONS; EQUATIONS; FUNCTIONS OF A COMPLEX VARIABLE; FUNCTIONS OF A REAL VARIABLE; FRACTIONS; GEOMETRY; GROUPS; GRAPHICAL METHODS; INFINITY; LOGARITHMS; MATHEMATICAL MODELS; MAGIC SQUARES AND CIRCLES; METRIC SYSTEM; MEASURES, UNITS OF; NUMERALS; NUMBERS, THEORY OF; NON-EUCLIDEAN GEOMETRIES; PROJECTIVE GEOMETRY; PROBABILITY AND ERROR; PI; QUATERNIONS; SURFACES; SOLIDS; TRANSCENDENTAL NUMBERS; TRIGONOMETRY, and the articles referred to under the most important of these. D.E.S.

MATHER, COTTON (1663-1728), American Congregational clergyman, author and scholar, son of Dr. Increase Mather, was born in Boston, Mass., Feb. 12, 1663. He was graduated from Harvard when only 15 years of age, and in 1685 was ordained as colleague to his father in the pastorate of the North Church, Boston, where he remained for the rest of his life. It is claimed that he wrote over 350 volumes, some of which were never published. His *Essays to Do Good* (1710) is best known, Benjamin Franklin stating that he was greatly influenced by it. He claimed to be able to write in seven languages, and is reputed to have read more books than any of his contemporaries. His library was the largest private collection in the country at that time. Glasgow University gave him the degree of D.D. in 1710, and three years later he was made a Fellow of the Royal Society, being the first American to be so honored. He was denounced by some for his part in the witchcraft episode at Salem. Even his friends admit that in spite of his learning, his judgment was often poor and he was rather vain. He died in Boston, Mass., Feb. 13, 1728.

MATHER, INCREASE (1639-1723), American clergyman and author, was born at Dorchester, Mass., June 21, 1639. From Harvard College, where he was graduated in 1656, he went to Ireland to study at Trinity College, Dublin. He was pastor first of Great Torrington, then at Guernsey, Gloucester, Weymouth and Dorchester in England. Disliking the religious effects of the Restoration in 1660, he returned to Massachusetts the following year, and became pastor of the North Church in Boston. In 1662 he married Maria Cotton. Elected a fellow at Harvard in 1675, ten years later Mather became president of Harvard, holding that office until 1701. In 1688-92 he was in London for the purpose of obtaining the colonial charter of MASSACHUSETTS; in this he failed, but he did obtain the liberalization of the charter of 1691. After 1701 Mather devoted his time to writing and to religious matters of the Congregational Church. His attitude toward other sects became increasingly tolerant, while his great power in the Puritan colonies was indisputable. He published many volumes, one of which, *Cases of Conscience*, 1693, expressed the attitude which made him influential in stopping the civil prosecution of "witches" in Massachusetts. He died at Boston on Aug. 23, 1723.

MATHER, RICHARD (1596-1669), Colonial preacher, was born at Lowton, England, in 1596. He was educated at Oxford, ordained in the Church of England and held a charge at Toxteth for 15 years, when he was suspended for non-conformity. In 1635 he emigrated to New England and preached in a Dorchester, Mass., church the rest of his life. He helped to compile the *Bay Psalm Book*, and to arrange an order of church discipline. One of the most famous preachers of the New World, his *Journal*, published in 1850, is of great interest. He died at Dorchester, Apr. 22, 1669.

MATHESON, KENNETH GORDON (1864-1931), American educator, was born in Cheraw, S.C., July 28, 1864. He graduated from Stanford University in 1897 and studied further at the University of Chicago and Columbia. From 1885-96 he was connected with various military academies as commander of cadets and teacher of English. In 1897 Matheson became professor of English at the Georgia School of Technology, was chairman of the faculty 1905-06 and president from 1906-22. In the latter year he became president of Drexel Institute, which office he held until his death at Bryn Mawr, Nov. 29, 1931.

MATHESON, SAMUEL PRITCHARD (1852-), Canadian prelate, was born in Manitoba, Canada, Sept. 20, 1852. He was educated at St. John's College School and St. John's College, Winnipeg, and was ordained a deacon in 1875, becoming a priest the following year. He was professor of exegetical theology at St. John's College and subsequently became dean of St. John's Cathedral. After serving as warden and chancellor of St. John's College, he was appointed chancellor of the Provincial University of Manitoba in 1900. From 1905 to 1931 Matheson was archbishop of Rupert's Land, and from 1909 to 1931 primate of Canada.

MATHEWS, SHAILER (1863-), American educator and editor, was born May 26, 1863 at Portland, Me. His education was received at Colby College, Newton Theological Seminary and at the University of Berlin. After professorships in rhetoric and political economy at Colby from 1887-94 he went to the University of Chicago, becoming the dean of its Divinity School in 1908. As author he is chiefly known for his *Social Teaching of Jesus*, 1897; *The Church and the Changing Order*, 1907, and *Validity of American Ideals*, 1922. He was the editor of *The World Today*, 1903-11, and the *Biblical World*, 1913-20. From 1912-16, Mathews was president of the Federation of the Churches of Christ in America.

MATILDA (1102-64), Queen of England and Empress of Germany, was born in 1102, the daughter of Henry I of England. At an early age she was married to HENRY V of Germany, who died in 1125. By her marriage about 1130 to Geoffrey Plantagenet, the future HENRY II was born in 1133. Matilda was crowned queen of England in 1141. For some years she carried on a struggle with Stephen, rival claimant to the throne, but in 1148 retired in favor of her eldest son, who in 1154 became Henry II of England. Matilda died in Normandy on Jan. 30, 1164.

MATINS, until the 11th century generally called *vigiliae* (night watches), the first and principal part of

the BREVIARY, sometimes said at daybreak. They usually consist of three nocturnes.

MATISSE, HENRI (1869-), French painter, was born at Cateau, department of the Nord, Dec. 31, 1869. He studied at the École des Beaux-Arts at Paris, but broke away from conventional painting and followed his own original ideas. He became a prominent member of the school known as "les Fauves" (*see* FAUVISM), which included such painters as Vlaminck and Derain. In his work Matisse has sought simplicity and a high imaginative quality. Among his most important paintings are *Joie de Vivre,* 1906-07, Barnes Foundation, Merion, Pa.; *Blue Nude,* 1907, Cone Collection, Baltimore, Md.; *The Dance,* 1909-10, Museum of Modern Western Art, Moscow; *Window,* 1916, Detroit Institute of Arts; *Interior With a Violin Case,* 1917, Bliss Collection, Museum of Modern Art, New York; *Moorish Screen,* Paine Collection, Boston, Mass.; and *Odalisque,* 1926, artist's collection. In 1931 Matisse began a series of murals for the Barnes Foundation at Merion, Pa.

MATOPPO HILLS, a range of hills in Africa, forming the watershed which divides the LIMPOPO RIVER from the ZAMBEZI. The Matabele Tableland, rising to a height of 4,000 ft., and BULAWAYO are situated on the slopes.

MATRIARCHY, literally the rule of the mother, the word popularly applied to the primitive social order in which the mother takes precedence of the father in line of inheritance and other important features of family life. For the reckoning of descent, kinship, and succession through the mother, however, matriliny is the more accurate word. The term matriarchy has been frequently subject to one of two misinterpretations: first, that it indicated an early form of society in which women were all-powerful; or, second, that it rested upon a general custom of sexual promiscuity which was a feature of the lowest form of humanity's social life, and from which the family as it is known developed. Complete female dominance remains legendary; in societies where descent is counted through the mother alone, woman does not therefore become the ruler, personally or tribally, in spite of her importance in the primitive family. Modern scientific research discards the theory of promiscuity as a universal stage in man's social history. In widely separated parts of the world, matrilineal societies still survive, as in Australia, in several districts in Africa, in India, Sumatra and Formosa and in North America among several Indian tribes.

MATRICES, in mathematics. *See* DETERMINANTS.

MATRIMONY VINE (*Lycium halimifolium* and *L. chinense*), a spreading bushy plant of the nightshade family called also box-thorn. It is a native of southeastern Europe and western Asia, extensively planted for ornament and widely naturalized in the eastern United States and Canada. The slender, half-climbing or trailing stems, 6 to 25 ft. long, bear slightly angled, sometimes spiny branches, lance-shaped leaves, purple flowers varying to greenish, and oval orange-red berries.

MATSUDAIRA, TSUNEO (1877-), Japanese statesman, born in Tokyo. After graduating from the Tokyo Imperial University in 1902 he entered the diplomatic service. He was in charge of diplomatic affairs of the Siberian Expedition of 1918-19, Vice-Minister for Foreign Affairs 1924-25, Ambassador to the United States 1925-28 and became Ambassador to Great Britain in 1929. Matsudaira has been one of the outstanding liberals in Japanese political circles.

MATSUKATA, MASAYOSHI, PRINCE (1835-1924), Japanese financier, was born at Kagoshima. In 1881 he became Minister of Finance and during his second term in this office from 1896 to 1897 he established the Japanese currency upon the gold basis and introduced the use of paper money. He became a member of the Privy Council in 1903 and in 1917 Lord Keeper of the Seal. He died at Tokyo, July 2, 1924.

MATTAPONY, a very small North American Indian tribe of the Algonkian linguistic stock. They belonged to the POWHATAN confederacy and in the early 17th century lived on the Mattapony River in Virginia. Though in 1781 there were said to have been only fifteen or twenty living, interbred with Negroes, a few still continue to use the name to the present day and live on a State Reservation on the south side of the Mattapony River. They are closely allied to the Pamunkey who live near by.

MATTEOTTI MURDER. The murder of Giacomo Matteotti, a Socialist deputy of the Italian Chamber, occurred on June 11, 1924, under peculiarly horrifying circumstances. Matteotti had not only taken the lead in opposing Fascism in the new Parliament, but had already published a book, *The Fascisti Exposed,* 1924, in which he enumerated many Fascist murders and other acts of illegality. Furthermore, he announced his determination to expose the corruption of Finzi, the Fascist minister of the interior. This threat, coming at a moment of intense political tension, was directly the cause of its author's death, the plot which resulted in the abduction and brutal murder of Matteotti being carried out by Finzi and several other Fascists. In an effort to soften the popular horror and indignation Mussolini undertook a "purification" of Fascism, removing most of the party leaders from office; but the murderers of Matteotti escaped with almost no punishment. The attempt of the deputies of the opposition, who had withdrawn from Parliament, to make political capital of the tragedy and its subsequent revelations failed, and in 1926 Mussolini declared their seats forfeited and excluded them from Parliament.

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MATTER, in physics, whatever possesses INERTIA. It may be in a gaseous, liquid or solid state, but it still possesses inertia. Cyclones give some idea of the inertia of gases, and anyone who lands flat when diving is aware of the inertia of liquids. This universal property of matter is its distinguishing feature.

Matter is porous, i.e., it is made up of small particles called ATOMS which have a great deal of free space between them. The work of scientists in the past 30 years has thrown considerable light on the structure of matter. J. J. Thomson and the school he built up in the Cavendish Laboratory in Cambridge, England, were the chief proponents of the idea that not only was matter formed out of atoms, but that the atoms themselves had sub-particles. This led to the ELECTRON theory of matter, which supposes the atoms to be minute solar systems containing a nucleus about which negative charged particles, called electrons, revolve as do the planets about the sun. The nucleus carries a positive charge of electricity. The question may then be fairly raised as to whether matter may not be wholly electrical in its origin. This seems to be the most modern point of view. In the case of the simplest atom, viz., that of HYDROGEN, there is every evidence to indicate that the atom is built up of two simple units, a negative charge, the electron, and a positive charge, the PROTON. The atom of HELIUM, the next element in the atomic series, is made up of four protons and two electrons in the nucleus and two planetary electrons revolving about the nucleus. Thus, it is possible to go on with all of the other atoms and build them out of two kinds of building blocks, protons and electrons. *See also* ELECTRICITY.

S. R. W.

MATTERHORN, MOUNT, a famous mountain in the Alps, situated between the canton of Valais, in Switzerland, and Piedmont, Italy; Zermatt lies 6 miles to the northeast. It is a magnificent spectacle, rising as an isolated steep, rocky column. In reality it is the terminating point of an arête, with the Italian side rising in terraces and the Swiss side in slopes. The peak is horn-shaped, rarely snowclad and is unusually arduous to climb, except in summer. Gneiss is the chief rock constituent of this mass. The peak was first ascended in 1865 by an expedition led by E. Whymper, four of whose party lost their lives. Height, 14,703 ft.

MATTHEW, GOSPEL OF ST., the first of the Gospels in the New Testament, is named for the Apostle whom Mark and Luke also called Levi. He probably changed his name when he joined Jesus. Excepting in the description of the feast which he made for his old friends, tax-gatherers like himself, his name appears in the New Testament only in the list of the Apostles. No certain information regarding the place of his labors, or where his book was written, has been preserved. Although the tradition that the book was written by Matthew has been widely accepted, modern scholarship inclines to the view that it is based on the earlier written GOSPEL OF ST. MARK, and also on a collection of *The Sayings of Jesus,* possibly by Matthew, which suggested to the author the name of this book. The existence of such *Sayings* is confirmed by Jerome, Eusebius, Origen, Irenaeus and Papias. The date of the book as we now know it is about 80 A.D., or somewhat later. Because the book appears to emphasize that Jesus was the Jewish Messiah, and quotes widely from the Old Testament Scriptures, it was probably written for Jewish converts to Christianity.

The Gospel covers the ministry of Jesus at Capernaum, the Sea of Galilee, Nazareth and Jerusalem, and in the last eight chapters gives a detailed account of the events of the last week of Jesus' life. Familiar passages of this Gospel are, "Come unto Me all ye that labor and are heavy laden and I will give you rest," and "Where two or three are gathered together in My name, there am I in the midst of them." The fullest account of the Beatitudes and the Sermon on the Mount is found in this Gospel.

MATTHEW, ST., one of the twelve disciples of Jesus, Mark and Luke calling him Levi. He is said to have lived in Capernaum as a publican or tax-collector, a despised occupation. When he joined Jesus he gave a farewell feast to his fellow revenue agents, with Jesus as one of the guests, a situation which led certain Pharisees and scribes to murmur against Jesus because he dined "with publicans and sinners." The first of the Gospels is attributed to him, and modern scholars admit that he probably wrote *The Sayings of Jesus,* on which the earliest Gospel was based. Matthew appears only once more in the New Testament, and later information about him is very uncertain. In post-biblical literature Matthew and Levi are sometimes distinguished, as when Heracleon says "Matthew, Philip, Thomas and Levi" died natural deaths. Tradition makes him a missionary on the shores of the Black Sea and in Ethiopia, where he is said to have been martyred.



THE ANGEL OF ST. MATTHEW
The symbol in art of this saint. After an engraving by Martin Schongauer

MATTHEW OF PARIS (c. 1200-59), medieval historian, was born in England, but evidently resided at Paris for some time. He entered the monastery at St. Albans about 1217. In 1248 at the pope's request he journeyed to Norway to settle the difficulties of the Benedictine monastery at Trondhjem. In 1257 Henry III spent three weeks at St. Albans, during which he related to Matthew much contemporary English history and statistics. His chief work, the *Chronica majora,* covers the period from Creation to 1259. The earlier portion is the work of John of Cella, abbot of

St. Albans (d. 1214), and Roger of Wendover, with certain modifications by Matthew. The period 1235-1259 is the independent work of Matthew. The *Historia Anglorum* consists of excerpts from his longer work covering the period 1067-1253. In the *Chronica majora* Matthew appears as an outspoken opponent of both royal and papal tyranny. These national sentiments are modified by omissions and changes in the shorter work. A good draftsman, he illustrated his work with pictures and maps, including a remarkably accurate itinerary for pilgrims from London to Jerusalem. He is the best source of information for contemporary England. W. I. B.

MATTHEWS, (JAMES) BRANDER (1852-1929), American critic and writer, was born in New Orleans, La., Feb. 21, 1852. He was graduated from Columbia University in 1871. He studied for the bar, but turned to a literary career before he began to practice. From 1892 until 1924 he was a member of the English faculty of Columbia University, for the last 24 years professor of Dramatic Literature. Matthews contributed both fiction and critical prose to the magazines, was an influential figure in the American theatrical world for a number of years and published 40 books, including *Molière,* 1910, *Shakespeare as a Playwright,* 1913, *Principles of Playmaking,* 1919, and *Rip Van Winkle Goes to the Play,* 1926. He edited a number of anthologies of plays and classical collections, and in collaboration with Bronson Howard wrote a comedy, *Peter Stuyvesant.* As a critic Matthews was scholarly and conservative. He died in New York City, Mar. 31, 1929.

MATTHISSON, FRIEDRICH VON (1761-1831), German poet, was born in the vicinity of Magdeburg, Jan. 23, 1761. His poems, which were published in 1787, were marked by wistfulness and a love of nature; one in particular, *Adelaide,* has been immortalized by the music of Beethoven. Matthisson was patronized by the King of Württemberg at whose court he held important posts. He died at Wörlitz, Mar. 12, 1831.

MATTOLE, a North American Indian tribe speaking a language of the Coast division of the Athapascan stock. Their villages were along the Bear and Mattole River in California, but resistance to white intrusion resulted in their practical annihilation. A few still live in Humboldt Co., Cal. Their language is distinctive from that of their other Athapascan neighbors, but culturally the Mattole are in the main like the HUPA.

MATTOON, a city of eastern Illinois in Coles Co., 75 mi. southeast of Springfield. The Illinois Central and Big Four railroads serve the city and maintain repair shops; and a municipal airport is accessible to the business section. There are large grain-elevators which handle the principal crops of the vicinity. The principal manufactures include shoes, steam-engines and water-works equipment. In 1929 the value of the factory output was about $5,000,000; the retail trade amounted approximately to $8,380,000. The site of Lincoln's early home in Illinois and the cemetery where Thomas and Sarah Bush Lincoln lie buried are south of Mattoon. During the Civil War a military camp was established and General GRANT mustered his first command at Mattoon. The earliest settlement was in 1849; a charter of 1867 is now in effect. Pop. 1920, 13,552; 1930, 14,631.

MATZENAUER, MARGARETE (1881-), Hungarian singer, was born at Temesvar, June 1, 1881. She studied at Hanover and made her operatic début at the Stadttheater, Strassburg, in 1901, singing later at the Hof-Theater, Munich. During 1911-29 she was a member of the Metropolitan Opera Company, New York. The great range of her powerful voice enabled her to sing both soprano and contralto rôles, including the three Brunhildes, Azucena, Dalila, Venus, and Ortrud. She has sung in many European cities and at the Bayreuth festivals. She became a citizen of the United States in 1918.

MAUCH CHUNK, a borough in eastern Pennsylvania, the county seat of Carbon Co. It is situated on the Lehigh River, 92 mi. northwest of Philadelphia and is served by bus lines and two railroads. The borough lies between Mt. Pisgah and Flagstaff mountain, on the edge of the anthracite mining district. The beautiful mountainous surroundings have made Mauch Chunk a popular summer resort. It is also a shipping point for coal, and has manufactures of silk. In 1827 the Lehigh Coal and Navigation Company built a switchback railway to carry coal from the mines to the river; this was converted into a scenic railway and is still in operation. Mauch Chunk was incorporated in 1846. The celebrated mine which has burned since 1832 is nearby. East Mauch Chunk adjoins Mauch Chunk. Pop. 1920, 3,666; 1930, 3,206.

MAUGHAM, WILLIAM SOMERSET (1874-), English dramatist and novelist, was born at Paris, Jan. 25, 1874. He was educated at Heidelberg, and studied medicine at St. Thomas's Hospital, London. His first novel was *Liza of Lambeth,* published in 1897, but it was with his plays that he began to attract attention. At one time four of his comedies were running simultaneously in London. *Lady Frederick, Jack Straw, The Circle* and *Our Betters* are among the best known and most popular of his plays, while *Rain,* which enjoyed considerable popularity in the United States, was founded on a short story of Maugham's called *Miss Sadie Thompson.* Among his novels are *Of Human Bondage, The Moon and Sixpence* and *The Painted Veil; Cakes and Ale,* published in 1930, evoked a storm of comment owing to the belief that Maugham had portrayed in it the life of one of the most respected figures in English literature, Thomas Hardy.

MAUMEE, a town in Lucas Co., northwestern Ohio. It is situated on the Maumee River, and the Miami and Erie Canal, 9 mi. southwest of Toledo. Bus lines, an electric railway and two railroads serve the city. Brooms and butter-coloring are the chief manufactures. Ft. Miegs and Ft. Miami were the scenes of battles during the War of 1812.

Nearby is the monument commemorating the Battle of Fallen Timbers. Maumee was incorporated in 1838. Pop. 1920, 3,195; 1930, 4,588.

MAUNDY THURSDAY is observed on the day before Good Friday. The name is derived from the Latin *Mandatum,* and relates to the "new commandment" (John 13:5 and 34) given by Jesus after he washed the disciples' feet. The feet-washing rite on this day still survives in some localities and churches, 12 paupers being chosen as beneficiaries. In England the rite was performed by the sovereigns to as many paupers as the sovereign was years old, James II being the last to observe it. The royal Maundy alms is still distributed at Westminster Abbey annually, although the specially minted Maundy coins are no longer found. In Catholic churches the holy oils are blessed on this day.

MAUNOURY, MICHEL JOSEPH (1847-1923), French soldier and general, was born at Maintenon, Dec. 11, 1847. He was educated at the École Polytechnique, and entered the army in 1869. He participated in the Franco-Prussian War, and in 1883 was appointed artillery professor at St. Cyr. In 1910 he became military governor of Paris, and on the outbreak of the World War, the command of the army of maneuver was assigned to him. He rushed the reserves north and in a superb attack turned the flank of the 5th German army, which was approaching Paris. In command of the 6th French army he checked the Germans in the first Marne offensive. During 1915-16 he resumed his post as military governor of Paris, having been severely wounded the preceding year. He died at Orleans, France, Mar. 28, 1923.

MAUPASSANT, HENRI RENÉ ALBERT GUY DE (1850-93), French master of the short story, was born at Château de Miromesnil, Aug. 5, 1850, of a good family. He was educated at Yvetôt and the lycée at Rouen, but his formal education went no further. His family fell from its prosperity, and Maupassant was forced to begin his long slavery as a government clerk in Paris, first in the Ministry of the Marine, and later as a member of the Department of Public Instruction. His letters of this period are an almost unbroken record of his dissatisfaction with the wire-pullings and petty tyrannies of his superiors. Through his mother he met GUSTAVE FLAUBERT, and was introduced to the circle which included Turgenev, Daudet and Zola, but these writers seemed quite unaware of the presence of another genius among them, and Maupassant served a conscientious and hard-working apprenticeship of seven years under Flaubert, the most exigent of masters.

Maupassant's first appearance in print was a book of poems, *Des Vers,* published in 1880. It was an unremarkable book so far as any aptitude for verse was concerned, but its sale was prohibited—a fact which engaged Flaubert's warmest sympathy, because of his experience with MADAME BOVARY. However, Maupassant himself realized that he was working in the wrong medium, and turned to prose. In the same year he contributed a story, *Boule de suif,* to the symposium called *Soirées de Médan,* and was recognized at once as a master of the short story. His success as a writer of *contes* was confirmed by the appearance of *La Maison Tellier* in 1881, and *Mademoiselle Fifi* in 1883. *Une Vie,* his first novel, was published in the same year. It was suppressed, and Maupassant became a literary storm center. He was anathematized and praised by opposing camps for the same qualities: his inhuman detachment, his stripped, rapid prose, and the care which he took to show no prejudices, no esthetic leanings and no moral judgments in his work.

That Maupassant was a master in his chosen form is beyond argument; but his poverty, grinding work and official wranglings, with the disease which he contracted in youth and which killed him in his 43rd year, made him considerably less than the purely unprejudiced writer his contemporaries considered him. A note of contempt for humanity runs through his work, and more than once, as in *Bel-Ami,* he turned his energy to the detailed portrayal of a completely contemptible character. Maupassant's last years were hideous with pain and mental degeneration, from which he tried unsuccessfully to escape by suicide. He continued however to write, producing between 1887-90 three volumes of short stories, *Le Horla, Le Rosier de Madame Husson* and *Inutile Beauté,* three novels, *Pierre et Jean, Fort Comme la Mort* and *Notre Coeur,* and a travel book, *La Vie Errante.* He died in Paris, July 6, 1893. *See also* CONTE; FRENCH LITERATURE; SHORT STORY. D. B.

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MAURICE, ST. (3rd century), early Christian martyr, was an officer in the famous Theban Legion composed entirely of Christian soldiers. When this legion was ordered by the Emperor Diocletian to participate in putting down an insurrection among the Christians in Gaul, they refused, and legend says that the entire legion was exterminated. There has been much controversy as to whether or not this Theban Legion actually existed. The feast day of St. Maurice is celebrated on Sept. 22.

MAURICE, COUNT OF NASSAU (1604-1679), Dutch colonizer, governor of the Dutch settlements in Brazil, 1637-1644. He was sent out by the Dutch West India Company to establish Dutch rule over Pernambuco and six other provinces of Brazil. His plans were frustrated by the revolt of Portugal against Spain in 1640, and he was recalled to the Netherlands in 1644.

MAURICE, PRINCE OF ORANGE AND COUNT OF NASSAU (1567-1625), son of William the Silent, was born at Dillenburg, Prussia, Nov. 14, 1567. Following his father's assassination in 1584, he was elected Stadholder of Holland and Zeeland and of the Seven United Provinces in 1587. His cam-

paigns against the Spanish made him one of the outstanding generals of his age. In 1609 at the instigation of OLDENBARNEVELDT Spain agreed to a twelve-year truce. Maurice brought about the execution of Oldenbarneveldt and continued the war until his death at The Hague, Apr. 23, 1625.

MAURISTS, a French congregation of the Benedictine Order which flourished in the 17th and 18th centuries. It was at first erected as an independent branch of the Congregation of St. Vannes. Approved by Louis XIII, Cardinals de Retz and Richelieu and Popes Gregory XV and Urban VIII, the Maurists became famous for their learning and piety; Mabillon, Thierry and Pierre Constant were among their illustrious scholars. In 1700 they had 180 establishments in six provinces but, weakened by Jansenism and irregularities, were dispersed by the Revolution. An attempt at restoration in 1817 failed for want of papal approbation.

MAURITANIA, a French colony on the west coast of Africa, bounded on the west by the Atlantic, on the east by French Sudan, on the south by the Senegal and on the north by Rio de Oro and Algeria. The area is 347,400 sq. mi. Mauritania has no high elevations. The coast is marked by sand dunes, behind which are salt lagoons. Very little rain falls in the south, where there is a belt of bush savanna, but a strip about 25 mi. wide receives an annual inundation from the summer flood of the Senegal. This district is known as the Chemana. Here the Sudanese grow maize and millet, and the French are attempting the cultivation of cotton and sisal, but development is hindered by lack of labor. Arabs and Berbers are found in the interior oases, raising dates to exchange for Chemana products, and rearing camels and Barbary horses. An important fishing industry has been developed chiefly by Breton sailors off Cape Blanco. Pop. 1926, 289,184.

In 49 B.C. Julius Caesar recognized the sons of Bocchus as rulers of the country in return for their support against Pompey. In 25 B.C. the country was given to Juba in return for Numidia, which was made a province under Augustus. In 40 A.D. it was divided by Claudius into the provinces of Tingitana and Caesariensis with the Malva River as the division point. The Romans established seven colonies in the former and eleven in the latter part of Mauritania.

MAURITIUS, a British island of the Indian Ocean, one of the group known as the Mascarene Islands. It lies 500 mi. east of Madagascar and covers an area of 720 sq. mi. The coast is lined with coral reefs and the interior is dominated by rugged mountains rising from 2,000 to 3,000 ft. above the water. Between the mountains lie fertile valleys traversed by streams. Sugar is the principal product. In 1927 the total output of sugar reached 254,000 metric tons. Other important products are copra, aloe fiber and coconut oil. Mauritius was discovered by the Portuguese in the 16th century. The island, with its dependencies, forms a British colony. PORT LOUIS is the capital and largest town. Mauritius was formerly known as Île de France. In 1928 the population of Mauritius was estimated at 404,802.

MAUROIS, ANDRÉ (1885-), Franch writer, was born at Elbeuf in 1885, and was educated at Rouen. In 1918 he published *Les silences du Colonel Bramble,* but he was not widely known till 1923, when his *Ariel, ou la vie de Shelley* appeared. This book was the forerunner of many biographies written in a novelized form. The author's *Disraeli* and *Byron* were both published in 1927. Maurois is the author of the novel, *Climats,* and other works.

MAURRAS, CHARLES (1868-), French writer, was born at Martigues, in 1868. He was educated at Aix, and in 1891 went to Paris to begin his literary career. A thorough Classicist, his attacks on Romanticism are vitriolic, and widely different from his critical writings, which recall the style of Sainte-Beuve. In *L'Avenir de l'Intelligence* Maurras deplores the leading away of the French intelligence by foreign doctrines, an evil which he would remedy by maintaining the old French philosophical and religious tradition.

MAURY, MATTHEW FONTAINE (1806-73), American naval officer and oceanographer, was born in Spottsylvania County, Va., Jan. 14, 1806. Entering the U.S. Navy in 1825, he served until incapacitated by an accident in 1839, when he was assigned to the Naval Observatory and Hydrographic Bureau at Washington. As a result of his work on this bureau, he published a series of *Wind and Current Charts,* which were the foundation of the present monthly publication of pilot charts and similar meteorological information of this office. He also published, in 1855, *Physical Geography of the Sea and Meteorology* and other works of great value to navigation. He became widely known as an oceanographic authority. In 1855 he was made naval commander. During the Civil War Maury joined the Confederates and was made head of the water defenses in the South. Because of his affiliations with the Southern cause he was obliged to remain out of the country for a time after the Civil War. He served in Mexico as Maximilian's commissioner of immigration, attempting to plant Virginian settlements in Mexico. In 1868 he was allowed to return to America, becoming professor of meteorology at Virginia Military Institute. In 1930 he was elected to the Hall of Fame. He died at Lexington, Va., Feb. 1, 1873.

MAUVE, ANTON (1838-88), Dutch painter, was born at Zaandam, Sept. 18, 1838. He studied with P. F. van Os but learned more from his friends Israëls and Maris. Mauve was highly successful in his depiction of the dykes and dunes of Holland which he rendered in delicate greys and greens. His canvases are hazy, atmospheric and have a quiet lyric quality. He is well represented in the Mesdag Museum, The Hague, the Ryksmuseum, Amsterdam, and the Metropolitan Museum, New York. Mauve died at Arnhem, Feb. 5, 1888.

MAVERICK, PETER (1780-1831), American engraver and lithographer, was born at New York City,

Oct. 22, 1780. He was instructed by his father, Peter Rushton Maverick, engraver and etcher. He aided in the establishment of the National Academy of Design. Maverick died at New York City, June 7, 1831.

MAWSON, SIR DOUGLAS (1882-), British explorer, was born at Bradford, England, May 5, 1882. He was graduated from the University of Sydney (Australia) as a mining engineer in 1901. In 1903 he investigated the geology of the New Hebrides and later obtained the degree of D.Sc. at the University of Adelaide, Australia and taught there. In Shackelton's expedition and in his own expedition, 1911-14, he explored the Antarctic between 87° and 143° E. long. His work definitely established that the land masses of the Antarctic constituted a continent and partially sketched the coast line under the overhanging ice cap. He was knighted in 1914 and became professor at Adelaide in 1920. He wrote *The Home of the Blizzard* in 1915. In 1929-30 he made another Antarctic expedition in an attempt to discover more of the coast under the ice, and in 1930-31 he again returned, planning to circumnavigate the continent and chart the still unknown edge of the ice cap.

MAXIM, HUDSON (1853-1927), American inventor, was born at Orneville, Me., Feb. 3, 1853. He obtained little academic education and busied himself with private chemical studies. In 1875 he developed a theory concerning the nature of atoms, closely resembling that afterwards generally accepted. After 1890 he turned to the development and manufacture of explosives, producing the first smokeless powder, modern heavy ordnance powder and a shock proof powder for use in armor piercing shells. He occupied valuable consultative positions during the World War and contributed a number of inventions to the U.S. government. Maxim died at Hopatcong, N.J., May 6, 1927.

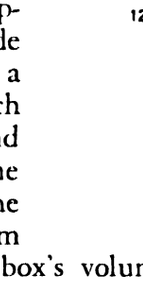
MAXIM, a practical precept for virtuous living condensed in expression to a sententious phrase. This form reached its highest development in France, in the *Caractères* of LA BRUYÈRE and the *Pensées* of PASCAL. The *Reflexions ou Sentences et Maximes Morales* of LA ROCHEFOUCAULD are not, correctly speaking, maxims at all, since they are conclusions drawn from human conduct rather than practical recipes for the regulation of behavior. A maxim may also be a terse and pithy expression which through common usage has come to represent a legal principle. Although many maxims are now obsolete, others are still used to replace wordy descriptions of points of law.

MAXIMILIAN, name of two German emperors. MAXIMILIAN I (1459-1519), "the last of the knights," was a master of all manly sports and well versed in the arts and sciences. He was continually involved in internal wars and foreign campaigns, but these merely tended to weaken his position. He was more fortunate in his marriage alliances. Through his marriage he brought to his house the possessions of the dukes of Burgundy; through that of his son, Spain and its possessions were added to the Hapsburg domains; by the marriage of his grandson with Anne of Hungary and Bohemia the Hapsburg claim to these broad lands in the east was established. He attempted to reorganize the government of the Empire, but in this he was doomed to failure. He enjoyed great popularity, however, until his death in 1519.

MAXIMILIAN II (1527-76), great-grandson of Maximilian I, was educated in Spain under CHARLES V, and saw active service in the war against France. He disputed the claim of Philip, son of Charles, to the empire. His tolerance of the Protestant factions as a political policy gained him the Empire after the death of his father in 1564. With the exception of his expedition against the Turks in 1566, he preserved peace in the Empire until his death in 1576.

MAXIMILIAN, FERDINAND JOSEPH (1832-67), Archduke of Austria and Emperor of Mexico, was born at Vienna, July 6, 1832. He was the brother of the Emperor FRANCIS JOSEPH. On Apr. 9, 1864 he accepted the offer of Napoleon III and Mexican political exiles to be Emperor of Mexico. He arrived in Mexico City on June 12, backed by a strong French army, and was received with apparent enthusiasm though the country as a whole was against him. In Dec. 1865, at the request of the United States, the French withdrew their army, though this was contrary to their agreement with Maximilian. Maximilian refused to escape and was captured and shot, June 19, 1867.

MAXIMUM AND MINIMUM VALUES, in popular language, the greatest and the least values that a variable, or a quantity that varies in value according to certain conditions, may have. For example, the maximum chord of a circle is the diameter of that circle, and the minimum chord is said to be zero, meaning that zero is the lower limit which a chord approaches as it decreases indefinitely. To take a simple case, suppose that an open box is to be made from a piece of tin 12 inches on a side by cutting squares from each corner and turning up the flaps, and that we are to find the side of the corner squares in order to give the box the minimum or maximum value. It is easily seen that the box's volume $V = (12 - 2x)^2x$, or $4x^3 - 48x^2 + 144x$.



Evidently $V = 0$ if $x = 0$, and, negative values of x being excluded, the minimum capacity comes when we cut out no squares. It also occurs when $x = 6$. The maximum value can be found by drawing a graph of the above equation.

If $x =$	0	1	2	3	4	5	6
then V =	0	100	128	108	64	20	0

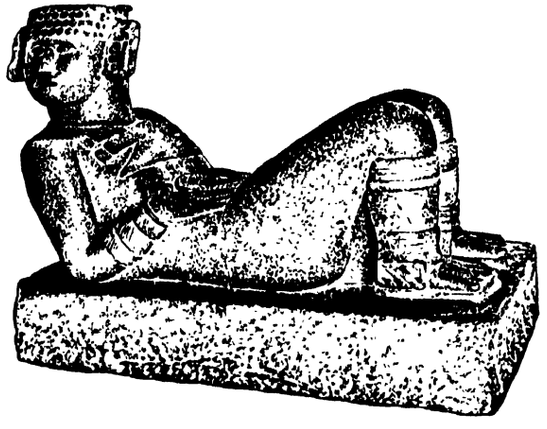
From the graph we see that V is greatest when $x = 2$, the value of V being then 128, and least, for positive values, when $x = 0$ or 6. A more simple way of finding maxima and minima is afforded by the CALCULUS.

MAXIMUS, ST. (c. 580-662), abbot of Chrysopolis, was born at Constantinople in 580. His noble parentage procured for him unusual educational opportunities, and because of his attainments and intellectual promise he became the confidential secretary of the Emperor Heraclius. Soon thereafter, however, he abandoned his secular career and entered the monastery of Chrysopolis in Scutari, of which he afterward became abbot. He was now swept into the great theological controversy raging in his day between the MONOTHELITES and the dyothelites; Maximus vehemently defended the orthodox or dyothelite position. This led to his persecution and martyrdom by the emperor of Constantinople, and he died at Lazica in the Caucasus Aug. 13, 662. He is revered as a saint both in the Roman and Greek Catholic Church, and his mystical writings have exerted considerable influence on subsequent thinkers.

MAXWELL, JAMES CLERK (1831-79), British physicist and mathematician, was born at Edinburgh, June 13, 1831. In 1856 he became professor of mathematical physics at Aberdeen, from 1860 to 1865 he was professor of physics and astronomy at King's College, London, and after 1871 first professor of experimental physics at Cambridge. He was one of the great mathematicians of his time, developing a theory of heat and giving strict mathematical form to Michael Faraday's electrical discoveries. His great work was the mathematical formulation of the laws of magnetic fields which Heinrich Hertz later extended to embrace light, and Heinrich Lorentz to cover electron radiation. He died at Cambridge, Nov. 5, 1879.

MAXWELL OF FLUX. *See* MAGNETIC UNITS.

MAYA, an important race and stock of American Indians living in the Yucatan Peninsula and adjacent regions in southern Mexico and Central America. Before the Spanish Conquest, the Maya, who have



COURTESY AMER. MUS OF NATL. HISTORY

MAYAN CHAC-MOOL FROM YUCATAN, MEXICO

The term refers specifically to this type of reclining figure

been called the Greeks of the New World, had developed the outstanding native American civilization and culture. They lived in populous and well-built cities, Chichen Itza, Peten, Uxmal, Uaxactun and others, which in their present ruined state are famous for their elaborately carved massive stone structures. In the 15th century the Mayan nation was devastated by a civil war which made it incapable of offering any effective resistance to the Spaniards. The Mayan stock includes the Maya of Yucatan, the Tzendal and Chinantec of Chiapas, the Cakchiquel, Mame and Quiche of the republic of Guatemala and the outlying tribe of Huastec of northern Vera Cruz. Over a half million people speak the 22 languages belonging to the Mayan group of which the Maya tongue, spoken by the Maya and by the Lacandone Indians of the Usumacinta Valley, is the chief. In stature, the Maya are short, averaging but 5 ft. 1 in. They are sturdy and well-built with well developed muscles and deep chests and are decidedly brachycephalic or round-headed. Their hair is dark and ordinarily straight, occasionally wavy. Light beards and moustaches are sometimes seen.

MAYA ARCHITECTURE. While walls of dressed stone were sometimes carried to the height of several stones in the communal dwellings of the Pueblo Indians and while the ancient Peruvians used marvelously fitted blocks of enormous size in their massive constructions, the Mayas of Central America were the only New World nation which devised a method for placing a permanent vaulting over rooms of serviceable width. Because of this discovery they were able to construct lofty temples and extensive palaces which have resisted the forces of decay since the early centuries of the Christian Era.

The Mayas lived in a region of plentiful limestone and very early in their career began to use this material not only in its natural state but also after it had been reduced to lime. Their walls were commonly made with a mortar and rubble filling neatly surfaced with cut stones having tenons at the back which extended into the central matrix. True ashlar masonry was employed by them very slightly, and their concrete and veneer construction seems much better fitted to resist the prying roots of the tropical forests to which the Maya ruins have been abandoned. Maya buildings became almost monolithic once the plastic stone had taken the new form. In Copan where volcanic tuff was plentiful and lime more difficult to obtain the walls of rectangular blocks are quite dilapidated.

Maya vaults are often described as of the corbeled variety made of overstepping stones, but actually nearly all of them are of limestone concrete with the dressed stones which provide a finished surface coming in contact only at their outer edges. The vaults are pointed rather than rounded and are commonly provided with struts of durable wood. The crown of the vault is in the form of a well-defined groove, and there is always a projecting shoulder at the spring of the vault. These two details indicate that a false work of poles may have been used to support the facing stones till the mortar set, since their presence would permit the ready removal of this false work. Maya vaults obtain a maximum width of between 13 and 14 feet; but the rooms can be of any length.

These rooms are often arranged tandem with the inner doorway in line with the outer one. In early Maya buildings the upper part of the outer walls incline inwards, but in later work this upper part is vertical and has a slight overhang over the lower part so that these also become stable units.

The historical succession of Maya architectural styles has been determined, first by dates, on stelae placed in front of the various structures or on lintels and tablets which are part of the building itself; secondly, by progressive changes and especially improvements such as, *a*, increased width of rooms combined with decreased thickness of walls; *b*, the evolution of roof crests and other decorative superstructures which raise mechanical problems of support; *c*, development of the sanctuary and other specializations in use of rooms; *d*, changes in systems of decoration.

Early Temples. The earliest example of Maya architecture now known is the pyramidal base recently uncovered at Uaxactun which may belong to the 2nd century A.D. It has an elaborate system of

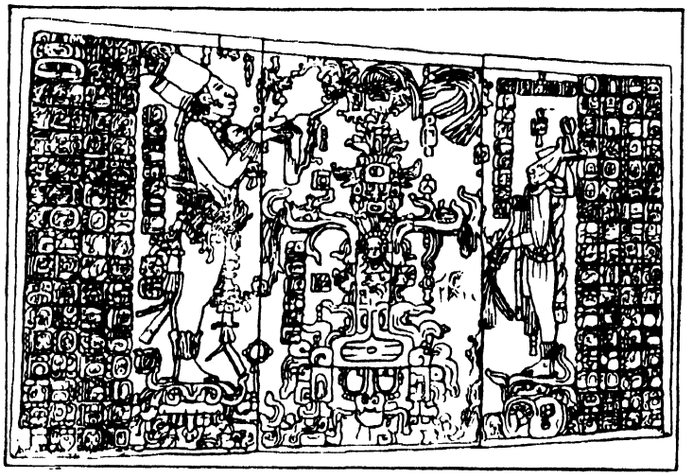


FROM AMER. MUS OF NATL. HISTORY

MAYAN SCULPTURED LINTEL FROM YAAXCHILA, MEXICO

stairways and rises in several terraces, the walls of which are decorated with stucco faces. Perhaps the lofty but extremely massive buildings on pyramids at Tikal represent the earliest extant temples. The walls of these buildings are very thick and the vaults are very narrow, scarcely more than three or four feet in width. Part of this structural ineffectiveness is explained by the great weight of the walls which surmount the roof. These are of solid masonry or contain at best small sealed rooms for the purpose of lightening the load. In these temples the vertical lower zone of the walls is plain and the upper zone has grotesque faces in relief. The front of the superstructure on the roof has a great, grotesque face. The pyramids are in sloping terraces with a single wide stairway project at the base. The height of these structures runs to nearly 200 feet, not counting the great raised platforms which are part of the city planning.

The refinement of the Maya temple of the First Empire can be traced through buildings at Yaaxchila



COURTESY AMER MUS. OF NATL HISTORY

TABLET OF THE SUN

Found in the Mayan ruins of Palenque, Mexico

leading up by sure degrees to the superlative beauty of three famous temples at Palenque. Here the roof combs are light and airy pieces of lattice work rising safely over a medial partition. The walls of the buildings are reduced in thickness and the rooms widened. The sanctuary develops into a miniature temple with its own appropriate decoration. The tablets of low relief sculpture relating to cosmic subjects and columns of decorative hieroglyphs are placed inside the sanctuary.

The sculptural accessories of the First Empire buildings are not equaled in later periods of Maya history although the mechanics of architecture hold their own in most regards and improve in some. These sculptural embellishments are most remarkable at Copan, where stone was used rather than stucco. The elaborate friezes of rulers in the habiliments of gods were evidently carved in place, after the buildings were finished, on blocks of stone already set into the walls for this purpose. Wonderful sculptures on the undersides of lintels occur at Yaaxchila and Piedras Negras.

Rambling Palaces. In addition to the temples, one finds in Maya cities large rambling edifices on low platforms which served as civic buildings or aristocratic habitations and are called palaces. After the First Empire the temple and palace are often combined. Early examples of the 9th century have ter-

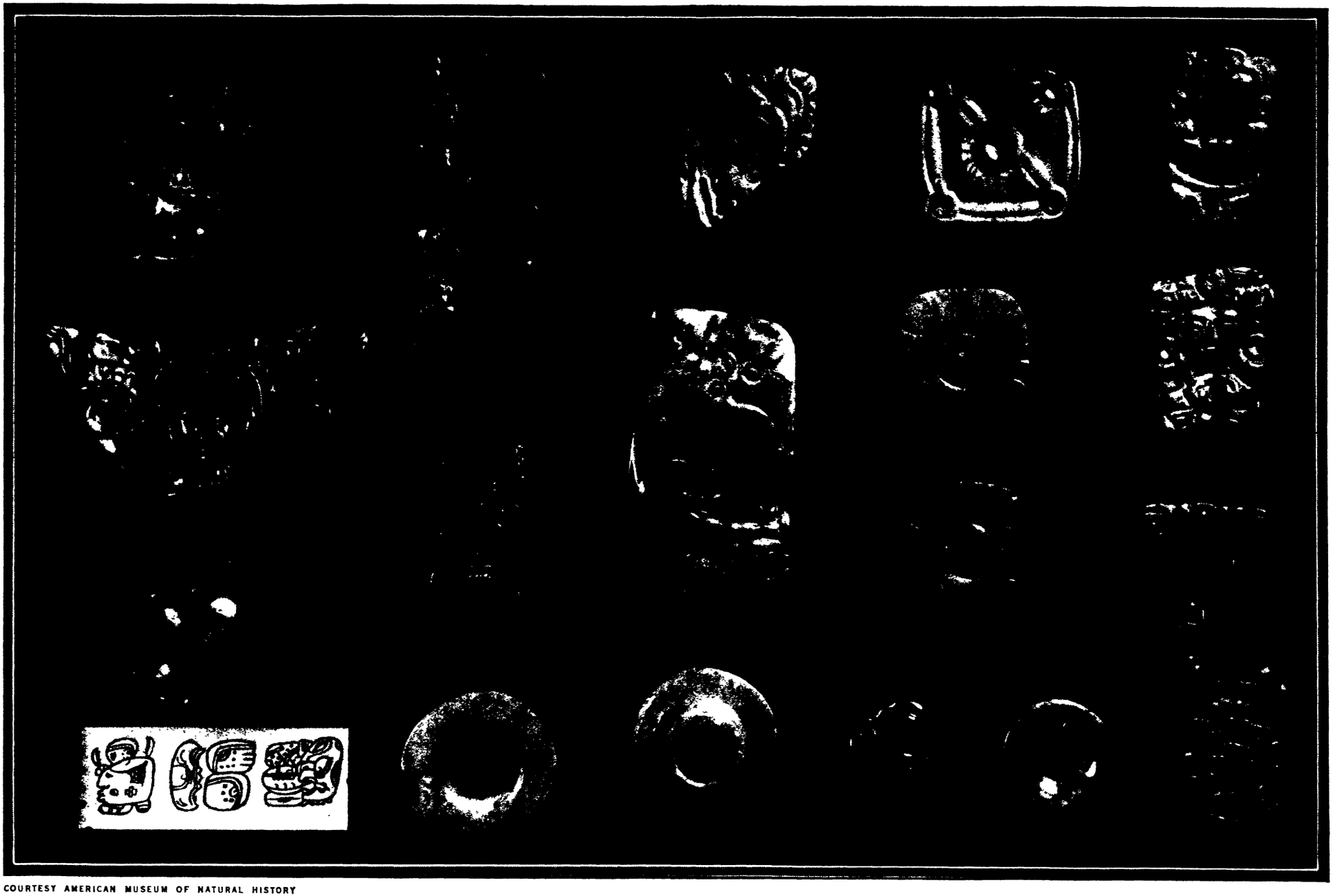
MAYA ARCHITECTURE



COURTESY PAN AMERICAN AIRWAYS, INC.: 2-6, AMERICAN MUSEUM OF NATURAL HISTORY

ARCHITECTURE OF THE ANCIENT PEOPLES OF MEXICO AND CENTRAL AMERICA

1. Ruins of the Mayan city of Chichen-Itzá, Yucatan, the Temple of the Warriors in the lower center and the Temple of the Serpent at the right. **2.** Model of the Temple of the Cross, Palenque, Mexico. **3.** Casa de las Monjas (House of the Nuns), Uxmal, Mexico, supposedly the residence of maidens destined for sacrifice to the gods, or the keepers of a sacred fire. **4.** Model of the Temple of Tikal, Guatemala, built around 300 A.D. by the Mayas. **5.** Carved doorway from Mexico. **6.** Restoration of the Temple of the Cross, Palenque, showing detail of the elaborate carving.



COURTESY AMERICAN MUSEUM OF NATURAL HISTORY

ANCIENT MAYAN JADE CARVING

Found near Ocoscingo, Mexico, these pieces of carved jade are of simple design and intended mainly for ornament. The drawing at the lower left shows in detail the figures on the object directly above.

minal towers which represent the temple element, with "hanging" stairways too steep for use ascending to blocked up doors. Here the decorative uses of mask panels or grotesque faces of gods are much in evidence. Also there are curiously formalized serpents. The temple palace called Tampak, near Santa Rosa, is a magnificent example of 10th or 11th century work rising in three stories. The great stairway leads to the third story, where one passes through a portal arch before entering the temple. There are five rooms in the third story, 12 in the second and 25 in the first story, and the center is solid masonry. The temple palace of Sayil is a late Second Empire structure, also in three stories and with nearly 100 rooms averaging 20 feet in length and about nine feet in width.

With the conquest of Chichen Itza by the Toltecs in 1191, a new style of architecture was introduced. Carved rectangular columns supported beams of hard wood, over which light arches of the Maya style were constructed but without the old factor of safety. In the wide porticos the lintels rested on great columns, which were plumed serpents with upturned tails as capitals.

The Mayas used paint on their buildings, especially in the sculptural parts. They used fine plaster, which was an excellent base for murals in polychrome. In one First Empire city burned bricks were used. This was at Comalcalco, the name of which means in Aztec, House of the Clay Griddles. The Toltecs went much farther and cast handsome terra cotta tiles.

The Maya vault was not copied on the highlands of Mexico, where flimsy flat roofs prevailed. But there were remarkable achievements in stone work and painted stucco. Mitla, in the Zapotec country, is a 14th century site which shows stone architecture of a very high order, the patterns of decoration being adapted from textile art. H. J. Sp.

MAYAGUEZ, a city on the west coast of Porto Rico, at the mouth of the Rio Yaguez and second port of the island. The city is located at the foot of the picturesque Las Mesas mountains. It is the site of the College of Agriculture and Mechanical Arts of the University of Porto Rico. In Mayaguez much beautiful native lace-making is done and Porto Rico's needlework industry centers here. On account of cheap labor American manufacturers send materials ready for sewing to small shops and homeworkers. This industry is an important factor in the life of the city, where seamstresses sit at almost every open door. Mayaguez has public and private schools and a library. Pop. 1930, 37,000.

MAY APPLE (*Podophyllum peltatum*), a medicinal herb of the barberry family called also wild mandrake. It is common in low woods from western Quebec to Minnesota and southward to Florida and Texas. The erect stem, growing from a horizontal poisonous rootstock, gives rise to large, shield-shaped, palmately lobed leaves and white sweet-scented flowers, usually borne singly on a stout stalk from between the two upper leaves. The edible fruit, an oblong yellowish berry, 2 in. in length, ripens in late summer. From the rootstock is obtained the bitter resin podophyllin widely used as an ingredient in cathartic medicines.

MAY BEETLE (*Melolontha vulgaris*), a coleopterous insect of the family *Scarabæidæ,* called also "cockchafer" and "June bug." The large, dark-brown adult beetles feed on foliage at night, returning to the soil at dawn. Hatching in the ground, the white, curved-bodied larvæ feed on the roots of plants, doing extensive damage. They require from one to four years to mature. *See* June Bug; Cockchafer.

MAYEYE, an extinct tribe of the North American Indian Tonkawa linguistic stock. They lived in the 18th century near the San Xavier River in Texas. Their enemies, the Apache, when pressed to the south by the Comanche, forced the Mayeye to the southeast, where they lived with the Karankawa tribes and later vanished completely as a tribe.

MAYFIELD, a city in southwestern Kentucky, the county seat of Graves Co., situated 26 mi. southeast of Paducah; served by the Illinois Central Railroad. Mayfield is a market center for the region which produces large crops of tobacco and grain, also poultry and dairy products. The chief local interests are flour milling, clothing and cigar manufacture, machine shop, foundry and tobacco warehouse industries. Mayfield was settled in 1811 and incorporated in 1823. Pop. 1920, 6,583; 1930, 8,177.

MAYFLOWER, in botany, a name applied to various plants which bloom in May. In England the hawthorn (*Cratægus Oxyacantha*) is known as mayflower as are also the Marsh Marigold (*Caltha palustris*) and the Cuckoo Flower (*Cardamine pratensis*). In the United States several plants are likewise called mayflower. The Trailing Arbutus (*Epigæa repens*) is the mayflower of New England. In other parts of the country the Hepatica (*Hepatica americana*), the Spring Beauty (*Claytonia virginica*) and the wood Anemone (*Anemone quinquefolia*) are locally known as mayflower.

MAYFLOWER, one of two ships chartered to take the Pilgrims from England to the New World, and the only one which effected the passage. The *Mayflower,* 180 tons, and the *Speedwell,* 60 tons, left Southampton Aug. 5, 1620. The *Speedwell* proving unseaworthy, both ships put into Plymouth harbor for a transference of passengers. The *Mayflower* left Plymouth Sept. 17; the landing at the site of Plymouth, Mass., so named by the Pilgrims in honor of their last port of call, was made on Dec. 21, 1620. According to William Bradford's list, 41 families, including 102 persons, disembarked.

MAYFLOWER COMPACT, Nov. 11, 1620, the first written constitution in America, signed by 41 Pilgrims aboard the *Mayflower* in Provincetown harbor, one month before the landing at Plymouth. The subscribers, most of the adult males among the 100 or 102 passengers, thereby formed "a civill body politick . . . to enacte, constitute, and frame such juste and equall laws, ordinances, acts, constitutions,

and offices, from time to time, as shall be thought most meete and convenient for the generall good of the Colonie unto which we promise all due submission and obedience."

MAY-FLY, an insect of the order *Ephemerida* (or *Ephemieroptera*), known also as the shad-fly or the day-fly. The adults are delicate, net-winged creatures often seen in great numbers over water or near street-lights. Their fore wings are much larger than the hind wings. Two or three long filaments are present at the tip of the abdomen, and in the male a pair of clasping organs. The mouthparts are vestigial. Adults of some species live but a few hours; others may live several days. Mating occurs only in flight and the eggs are laid in water. The nymphs are aquatic, living under stones in rapid water, or burrowing in mud and silt in rivers and lakes. Most species are herbivorous. In some forms the nymphal stage may last two years. Full-grown nymphs come to the surface, the skin splits, and a dull-colored, winged insect emerges, the subimago. In no other order of insects does such a stage in the life history occur. Subimagoes rest quietly for a number of hours, then shed skin again, and the clear-winged adult emerges. The nymphs, subimagoes and adults are eagerly eaten by fishes. J. R. T.

MAYHEM, unlawfully and violently depriving a human being of a part of his body or the use of a part of his body whereby he is less able to defend himself. Statutes have extended the crime to cover any malicious disfiguring of the body of another.

MAYNARD, a town of eastern Massachusetts, in Middlesex Co., situated on the Assabet River, 25 mi. northwest of Boston. It is on the Boston & Maine railroad. The chief manufactures are woolen goods, powder, gum, and cellulose products. Pop. 1920, 7,086; 1930, 7,156.

MAYO, CHARLES HORACE (1865-), American surgeon, was born in Rochester, Minnesota, on July 19, 1865. After attending the Rochester High School, private schools, Northwestern University and Chicago Medical College, he began to practice medicine in Rochester, and established with his father and brother the Mayo Clinic. His early operations were performed on the eye, ear, nose and throat and he also did considerable neurologic, orthopedic, thoracic and plastic surgery. More recently Doctor Mayo has been devoting much of his time to urologic and general surgery, as well as to goiter. He is a charter member of the American College of Surgeons. He served in the U. S. Army during the World War, alternating with his brother, William J., as chief consultant in all surgical service. In 1915, Charles Mayo and his brother founded the Mayo Foundation for Medical Education and Research at Rochester, which has become a department of the Graduate School of the University of Minnesota. Dr. Mayo has received honorary degrees from many universities, and has been president of various medical societies. M. F.

MAYO, WILLIAM JAMES (1861-), American surgeon, was born in Le Sueur, Minnesota, June 29, 1861. He graduated from the University of Michigan, M.D., 1883. Subsequent to his graduation, he began practice of surgery in Rochester. A small hospital was organized under the local branch of the Sisters of St. Francis, which developed into St. Mary's Hospital. Here, he, with his younger brother, Charles Horace, established the Mayo Clinic in 1889, which has become renowned. Dr. Mayo specialized in surgery of the stomach, and he has written extensively on surgical topics. In 1907, he was appointed a regent of the University of Minnesota. He was president of the American Medical Association (1905-06), of the Minnesota State Medical Society in 1895, and of the American Surgical Association (1913-14), of the Society of Clinical Surgery (1911-12), of the American Physicians and Surgeons (1925). He has received honorary degrees from many universities and is a member of many noted societies. Dr. Mayo gave his services to the Army in the World War and alternated with his brother, Charles, as chief consultant for all surgical service. M. F.

MAYOR, the chief official of a municipality (French *Maire* and German *Burgermeister*). His powers vary greatly. In some cities, particularly in England and in American cities with the commission or manager plan, he is merely president of the council. In others he possesses very broad executive powers. In England, France, Germany and manager and commission cities in America, he is elected by the council. Elsewhere in the United States he is elected by the people. *See also* MUNICIPAL GOVERNMENT.

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MAYPOPS, the name given to the large edible fruit of the PASSION-FLOWER (*Passiflora incarnata*), a handsome vine found in the southern states.

MAYSVILLE, a city in northeastern Kentucky, the county seat of Mason Co., situated on the Ohio River at the mouth of Limestone Creek, 60 mi. southeast of Cincinnati, O. River craft and two railroads serve the city. Maysville is an important shipping center for tobacco, grain and livestock, and at one time was a leading hemp market. The city has cotton and flour mills, automobile and bicycle accessories factories and loose leaf tobacco warehouses. A blockhouse was built here in 1784. The city was chartered in 1833 and became the county seat in 1848. Pop. 1920, 6,107; 1930, 6,557.

MAYSVILLE ROAD VETO, May 27, 1830, a political act of President Jackson which checked the participation of the United States in projects for internal improvement. The bill which was vetoed would have authorized a subscription of stock by the United States in the Maysville, Washington, Paris and Lexington Turnpike Road Co., incorporated by the State of Kentucky to build in that state a section of a road planned to run from Florence, Ala., to Zanesville, O. Jackson contended that the Maysville Road was of local, not national, character; and that Federal aid even to projects of national character should have the sanction of a constitutional amend-

ment. Without Jackson's interposition the probability is that the United States would have mortgaged its credit as heavily as did the individual states in the flotation of canals, railroads and turnpikes between 1830 and 1837.

MAYWEED, a name given to the DOG-FENNEL, a rank-smelling weed native to Europe and widely naturalized to North America and other regions.

MAYWOOD, a residential town in Los Angeles Co., in southern California, situated 5 mi. southeast of Los Angeles. The Los Angeles and Salt Lake Railroad serves Maywood. The town is surrounded by an industrial district. Pop. 1930, 6,794.

MAYWOOD, a residential suburb of Cook Co., Ill., 10 mi. northwest of Chicago, on the Desplaines River, served by three main railroad lines. It has tin can and plate works and smaller industries. The manufacture of tin cans was begun in 1873. The retail trade in 1929 amounted to $8,347,729. Roses are cultivated extensively. The village was founded in 1869 and incorporated in 1881. The expansion of Chicago accounts for the growth of population. Pop. 1920, 12,072; 1930, 25,829.

MAZARIN, JULES (1602-61), French cardinal and crown minister, was born at Piscina, Italy, July 14, 1602. He was educated as a Jesuit, but it is debatable whether he ever took holy orders. In 1625 he entered the Vatican army as an infantry captain. For a time he was vice-legate at Avignon, but soon was sent to Paris as nuncio-extraordinary. While there he met Cardinal Richelieu, at whose suggestion he was naturalized as a French subject in 1639, and entered the services of that country, winning rapid promotion. He was created cardinal in 1641, though it is certain that he never visited Rome to receive the cardinal's hat. Mazarin cleverly managed to effect the occupation of Sedan by French troops; and Richelieu on his death bed recommended him as his successor. In 1642 Louis XIII died and his widow, Anne of Austria, who acted as regent for the young Louis XIV, became deeply attached to the cardinal, and succeeded in retaining the apparently reluctant Mazarin in office. By the treaty of Westphalia, 1648, at the conclusion of the Thirty Years war, Mazarin continued Richelieu's policy and extended France to the Rhine, obtaining Alsace, with the exception of Strasburg. However, the oppressive taxation as well as the disorders that followed peace, made the victory a costly one. Mazarin's domestic policy of absolutism brought about revolts, known as the FRONDES, and he was twice driven from France by the pamphleteering campaign waged against him. He became Bishop of Metz in 1653. Maintaining the friendship of the queen, he formed the League of the Rhine under French leadership to hold in check the empire of Austria. Mazarin's policy of absolutism put France in order for the reign of the powerful Louis XIV. He died at Vincennes Mar. 9, 1661.

MAZATLÁN, a seaport of Mexico, situated in a small peninsula on the Pacific coast, in the state of Sinaloa. It is one of the chief commercial ports on the Pacific coast of Mexico. It exports some gold and silver, salt and dry fish and fruit. Mazatlán has a weather bureau, customhouse, chamber of commerce, and two hospitals. Its schools, churches, market, and public buildings are similar to those in other Mexican towns. Pop. 1926, 28,000; 1930, 51,098.

MAZURKA, a Polish dance in triple meter and usually in brisk tempo. The rhythm is characterized by an accent on the second beat and has been immortalized by FREDERIC CHOPIN whose 52 mazurkas are among his most individual compositions for the pianoforte.

MAZZINI, GIUSEPPE (1805-72), Italian patriot, born at Genoa, June 22, 1805, the son of a physician. He became interested in the ideas of the French Revolution, abandoned his study of the law and became an enthusiastic, if idealistic, champion of Italian nationality. In 1820 he took part in an uprising, was arrested and imprisoned at Savona. On being liberated he escaped to Marseilles and thence to London, where he spent the greater part of the rest of his life as an exile, often in extreme poverty. No hardships, however severe, seemed to dampen his enthusiasm. Unceasingly he labored to arouse the spirit of patriotism among the Italians. He founded "Young Italy," wrote political pamphlets, organized revolutionary movements and with Garibaldi organized the short-lived Roman Republic in 1849 after the defeat of the Italians the year before. An idealist, and an ardent republican he was nevertheless one of the great leaders in the unification of Italy, accepting the monarchy sorrowfully, because it seemed the wish of his countrymen. He died at Pisa, Mar. 10, 1872.

McADOO, WILLIAM GIBBS (1820-94), American jurist, was born near Knoxville, Tenn., Apr. 4, 1820, and educated at East Tennessee University. After serving in the Mexican War he practiced law and in 1851-60 was attorney-general of the Knoxville judicial district. He served as a captain in the Confederate army during the Civil War. In 1871 he was appointed judge of the 20th judicial district of Georgia. He died in 1894. He was the father of WILLIAM G. MC ADOO (1863-).

McADOO, WILLIAM GIBBS (1863-), American lawyer and Secretary of the Treasury under President Wilson, was born near Marietta, Ga., Oct. 31, 1863. After studying law at the University of Tennessee, he was admitted to the bar in 1885, and practiced at Chattanooga, Tenn., until 1892 when he moved to New York. Here he made a thorough study of the transportation needs of the metropolis. He raised sufficient capital in 1902 to build the first tunnel system under the Hudson River. In 1912 he was appointed vice-chairman of the Democratic National Committee, and the next year entered the Cabinet. At a time when wartime expenditures constituted a complex problem for the Treasury, McAdoo discharged his duties with marked skill, floating the four great Liberty loans. He was an important figure in the adoption of the Federal Reserve System, and in 1918 became Director-General of Rail-

ways. The following year he resigned from the Cabinet. He failed to win the Democratic nomination for the presidency in 1920 and 1924. In 1932 he was elected a United States senator from California.

McADOO, a borough of Schuylkill Co., eastern Pennsylvania, situated in an important anthracite coal district, about 20 mi. northeast of Pottsville; it is served by two railroads. Mining is the principal industry. Tresckow Water Falls and Silver Brook Hollow are two charming natural landmarks of the borough. Pop. 1920, 4,674; 1930, 5,239.

McALESTER, a city in southeastern Oklahoma, the county seat of Pittsburg Co. Three railroads afford transportation. McAlester is surrounded by coal fields, and is a trade center for the mining and farming district. The local industrial activities include cotton ginning and railroad shop work. In 1927 the manufactured output was valued at $2,579,875. The retail trade in 1929 amounted to $8,369,123. Located here are the State Penitentiary, the Bureau of Indian Affairs and the United States Army Officers Headquarters. In 1906 the city was consolidated with South McAlester. It is governed by the commission-manager system. Pop. 1920, 10,632; 1930, 11,804.

McALLEN, a city of Hidalgo Co. in southern Texas, situated on the Rio Grande, 260 mi. south of San Antonio. An airport, bus and truck lines and two railroads serve the city. Cotton, citrus fruits and vegetables are produced in the vicinity, which is irrigated. This section of the valley of the Rio Grande is historically connected with the name of Gen. ZACHARY TAYLOR. The countryside includes fine farm land and good hunting grounds. McAllen was incorporated in 1910. Pop. 1920, 5,331; 1930, 9,074.

McBURNEY, CHARLES (1845-1913), American surgeon, was born at Roxbury, Mass., Feb. 17, 1845. In 1872-89 he was demonstrator of anatomy at the College of Physicians and Surgeons, New York; professor of surgery in 1889-1892; and professor of clinical surgery, 1892-1907. He greatly improved the treatment of appendicitis, discovering McBurney's point (a spot where pain upon pressure diagnoses a diseased appendix), and developing a type of incision which allowed access to the appendix without cutting across muscle tissue. He died at Brookline, Mass., Nov. 7,

McCLELLAN, GEORGE BRINTON (1826-85), American general, was born Dec. 3, 1826, at Philadelphia, Pa. In 1846 McClellan was graduated from the U.S. Military Academy as a lieutenant of engineers, and served immediately in the Mexican War. He was promoted to a captaincy for gallantry, and in 1853 undertook a series of Pacific railroad surveys for the government. He was sent to Europe in 1855 to observe tactics employed in the Crimean War, but in 1857 he resigned from the Army and from then until the Civil War he was associated with various railroads, finally serving as president. On the outbreak of the Civil War, he was commissioned as major-general of volunteers and later, with the same rank in the United States Army, he was given command of the Department of the Ohio, comprising Ohio, Illinois, Indiana, and western Pennsylvania and Virginia. In July 1861 he was ordered to Washington to organize the Army of the Potomac. In the fall of 1861 and the winter of 1861-62 he equipped and drilled his troops with a thoroughness which finally provoked an impatient clamor for a march "on to Richmond." In the spring and early summer he commanded the unsuccessful Peninsular Campaign against Richmond. McClellan explained his defeat as the result of Lincoln's meddling and lack of cooperation, and was relieved of his command in Aug., 1862. McClellan was exceedingly popular with his soldiers and this, coupled with continued northern reverses, led to his restoration to command in Sept., 1863, but the indecisive battle of Antietam, where McClellan delayed pursuit of the retreating enemy, again caused his removal. In 1864 he was Democratic candidate for the presidency, but was defeated by Lincoln. From 1864-68 he lived in Europe and upon his return he lived in New York City and at West Orange, N.J. He served as president of several railway and industrial companies, wrote articles and books, and delivered many important speeches. In 1877 he was elected Governor of New Jersey. He served capably and declined a renomination. McClellan died Oct. 28, 1885, at Orange, N.J.

McCLELLAN, GEORGE BRINTON (1865-), American publicist, was born in Dresden, Germany, Nov. 23, 1865. He graduated in 1886 at Princeton. After being admitted to the bar in 1892, he entered politics as a Democrat. McClellan was president of the New York Board of Aldermen in 1893-94; was in Congress from 1895-1903, and Mayor of New York from 1903-09. During the period 1908-12 he served as university lecturer on public affairs and in 1912 became professor of economic history of Princeton. He was a major in the Ordnance department during the World War, serving in the United States and overseas, and afterwards returned to Princeton.

McCOMB, JOHN (1763-1853), American engineer and architect, was born October 17, 1763 in New York, where he lived all his life. McComb became prominent for his architectural plans for both public and private buildings in New York and throughout the Eastern States. The front of the old Government House and the City Hall in New York were designed by him. He died in New York May 25, 1853.

McCOMB, a city in Pike Co., southwestern Mississippi, situated about 75 mi. southeast of Natchez. The Illinois Central Railroad, which has its shops here, and bus lines provide transportation. There is a municipal airport. Cotton, corn, dairy products and vegetables are raised. The city has cotton and sawmills, a coffee factory and an ice cream plant. The retail business in 1929 reached a total of $5,796,170. McComb was incorporated in 1872. Pop. 1920, 7,775; 1930, 10,057.

McCONNELL, FRANCIS JOHN (1871-), Methodist bishop, was born in Trinway, Ohio, Aug.

18, 1871, and educated at Ohio Wesleyan and Boston universities. In 1894 he entered the Methodist Episcopal ministry and for the next nine years occupied various pastorates in Massachusetts. In 1903-09 he served at the New York Avenue Church, Brooklyn; in 1909-12 acted as president of De Pauw University; and in 1912 was consecrated bishop. Thereafter he held numerous important church offices including president of the Federal Council of Churches of Christ in America in 1929. He is the author of *Religious Certainty, Democratic Christianity, Public Opinion and Theology,* and *The Christlike God.*

McCOOK, a city in southwestern Nebraska, the county seat of Redwillow Co., situated on the Republican River, 205 mi. southwest of Lincoln. Corn, alfalfa, wheat, sugar beets and live stock are raised in the vicinity. The Chicago, Burlington and Quincy Railroad, bus lines and an airport serve the city. Pop. 1920, 4,303; 1930, 6,688.

McCORMACK, JOHN (1884-), Irish tenor, born at Athlone, June 14, 1884. In 1903, without previous instruction, he won a gold medal for singing at Dublin Feis Ceoil. He studied under Sabattini at Milan, making his operatic début at Savona in 1905, in *L'Amico Fritz.* His first appearance in the United States was at the Manhattan Opera House, New York, in 1909, singing *La Traviata.* Later he was one of the leading tenors in the Metropolitan Opera House, as well as Chicago, Boston and Monte Carlo Grand Opera Companies. He has since appeared chiefly in concert. In 1919 he became a United States citizen. He has been made Knight Commander of the Order of St. Gregory the Great and Knight Commander of the Order of the Holy Sepulcher by the Pope, and also Chevalier of the Legion of Honor of France.

McCORMICK, CYRUS HALL (1809-84), American inventor, was born in Walnut Grove, Va., Feb. 15, 1809. He was educated in common schools, and worked with his father on the farm. In 1830 he invented two new plows, and the following year produced his greatest invention, the first practical reaping-machine ever made, which he patented in 1834. He moved to Chicago in 1847, and with his brother founded the famous factory for producing his harvesting machines. Mr. McCormick contributed to the foundation of Northwestern University and endowed a chair in Washington and Lee University. He died in Chicago, May 13, 1884.

McCORMICK, JOSEPH MEDILL (1877-1925), American newspaper publisher and statesman, was born at Chicago, Ill., May 16, 1877. He rose from reporter to publisher of the Chicago *Tribune.* Giving up journalism, 1908, to devote himself to the Progressive campaign of Roosevelt, in 1916 he was sent to the 65th Congress and from 1919 to 1925 was U.S. Senator from Illinois. He died at Washington, D.C., Feb. 25, 1925.

McCOY, CORNELIUS JOSEPH (1887-), American educator, was born in San Francisco, Cal., July 29, 1887. He studied at St. Ignatius College, and Gonzaga University, where he was professor of philosophy from 1913-19. McCoy studied from 1919-23 at the Colegio de San Francisco Javier, in Burgos, Spain, and in 1921 was ordained a Roman Catholic priest. He was vice-president of the University of Santa Clara from 1924-26, when he was made president.

McCRAE, JOHN (1872-1918), Canadian physician and poet, was born at Guelph, Ont., Nov. 30, 1872. He was educated at the University of Toronto, and attained high standing as a physician before going to the front in 1914. After the Battle of Ypres he was attached to the McGill University hospital unit, and attained the rank of lieutenant-colonel. He had marked gifts as a poet, and his famous lyric, *In Flanders' Fields,* was written during the Battle of Ypres. McCrae died in France, Jan. 28, 1918.

McCULLOCH, HUGH (1808-1895), American financier, was born in Kennebunk, Me., Dec. 7, 1808. He practiced law in Ft. Wayne, Ind., from 1833 to 1845 when he engaged in banking. McCulloch won a wide reputation as a financier. In 1863-65 he was U.S. Comptroller of Currency and in 1865-69, as Secretary of the Treasury, he solved many difficult post-war financial problems. In 1869 he became a member of the firm of Jay Cooke, McCulloch & Co. in London. Died near Washington, D.C., May 24, 1895.

McCULLOCH, JOHN RAMSAY (1789-1864), British economist and statistician, was born at Whithorn, Mar. 1, 1789. In 1828 he was appointed professor of political economy at London University, and in 1838 was made controller of the Government Stationary Office. McCulloch contributed to the *Edinburgh Review* leading articles on economic subjects for more than twenty years. His greatest book is *A Dictionary, Practical, Theoretical and Historical, of Commerce and Commercial Navigation.* He died at London, Nov. 11, 1864.

McDOWELL, IRVIN (1818-85), American general, was born near Columbus, O., Oct. 15, 1818. Graduated at West Point in 1838, he served as an officer in the Mexican War. When the Civil War broke out he was commissioned to organize the Federal volunteers in Washington. On May 14, 1861, he was made brigadier-general and given command of the Army of the Potomac which he was forced to lead prematurely into Virginia, and suffered defeat in July, 1861, in the first battle of Bull Run. Replaced by General McClellan, he commanded the 1st Corps of his army, being made major-general in March, 1862, and assigned to defend Washington. He was, however, detached from this army and, under General Pope, took part in the second battle of Bull Run, Aug. 29-30, 1862, when the Federal forces were again badly defeated. He was subsequently relieved of active duty, though continuing in the U.S. Army service. After the war he held various military posts, being made major-general in the regular army in 1872. General McDowell was a loyal and capable officer, but was unfortunate in his commands. He died in San Francisco, May 5, 1885.

McDOWELL, WILLIAM FRASER (1858-), Methodist bishop, was born in Millersburg, Ohio,

Feb. 4, 1858. He was educated at Ohio Wesleyan and Boston universities and ordained a Methodist Episcopal minister in 1882. During the next eight years he held pastorates in Ohio, and in 1890 was elected chancellor of the University of Denver. He resigned in 1899 to become corresponding secretary of the Board of Education of the Methodist Episcopal Church and after five years in this office was consecrated a bishop. Thereafter he lectured at various leading universities and in 1910-11 officially visited India, China and Japan. He published *A Man's Religion* and *Making a Personal Faith.*

McDUFFIE, GEORGE (c. 1788-1851), American statesman, was born in Columbia Co., Ga., about 1788, and educated at South Carolina College. Admitted to the bar in 1814, he began the practice of law at Pendleton, S.C. In 1821 he was elected to Congress where, as chairman of the Ways and Means Committee, he became a vigorous defender of the United States Bank against the attacks of President Jackson. But the chief purpose of his speeches in the House was to present a comprehensive exposition of South Carolina's opposition to the protective tariff, and to set forth the right of nullification as a means of securing redress for the state's grievances. In 1834-36 he was governor of South Carolina, and in 1843-46 a member of the United States Senate. He died at Cherry Hill, Sumter District, S.C., on Mar. 11, 1851.

McGEE, THOMAS D'ARCY (1825-68), Irish-Canadian journalist, statesman, and orator was born at Carlingford, Ireland, on Apr. 13, 1825. McGee emigrated to the United States in 1842 and almost immediately became known as a journalist and speaker and was recalled to Europe in 1845 to aid the Irish nationalist cause. Implicated in the rebellion of 1848 he escaped to the United States, where he remained until 1857 when he moved to Montreal. In 1858 he was elected to the legislative assembly of Canada as an Irish Roman Catholic and sat there until 1867 when he was sent to the new Dominion parliament. Besides holding office in pre-confederation governments, McGee was distinguished in the Confederation movement. He was a delegate to the Charlottetown and Quebec Conferences, but his main function was to lay a psychological basis for union by preaching a doctrine of Canadian nationalism. His eloquence by pen and speech fired the not unfamiliar cause of British North American union with a new appeal and in the decade before 1867 he was perhaps the most zealous apostle of Confederation. Nor was he merely a preacher, for at a time when men like Macdonald were still thinking in terms of a unitary type of state, McGee saw that the new Canada must be federal in its constitution. But his services were not confined to this cause; he was an advocate of westward expansion, he saw Canada's need for more immigration, doing what he could in parliament to stimulate it, and urging the desirability of railway construction as an economic and political asset. McGee was not a member of the first Dominion cabinet because, like Sir Charles Tupper, he stood aside in order that the claims of others might be satisfied, and his career was cut short by an assassin's bullet before he could win high honors in the new federation. On going to Canada he became loyal to the British Crown, though not ceasing to agitate better treatment for Ireland, and in 1866 he condemned most bitterly the Irish-American Fenian movement. He aroused so much resentment by his vigorous speech that on Apr. 7, 1868 he was assassinated by a Fenian as he was returning from a night sitting of the House of Commons. T. P. P.

McGILL, JAMES (1744-1813), Scotch merchant and founder of McGILL UNIVERSITY, Montreal, was born in Glasgow, Oct. 6, 1744, and was educated in Glasgow. In 1770 he went to Canada where he engaged in the fur trade in Montreal and became a partner in the Northwest Co. Eventually he amassed a large fortune. He was an influential citizen, prominent in politics and for some time served in the parliament of Lower Canada. During the War of 1812 McGill was commissioned brigadier-general of militia. He died in Montreal, Dec. 19, 1813, and by the terms of his will, £10,000 and specified tracts of his land were to be used for a college to bear his name. McGill University was chartered in 1821.

McGILL UNIVERSITY, Montreal, Canada, a coeducational university organized in 1821 under the will of James McGill (d. 1813). The original endowment has been augmented by numerous gifts and bequests, the chief of which were made by Sir William Macdonald. The present university has faculties of Arts and Sciences, Law, Medicine, Agriculture, Commerce, Engineering, Architecture, Library Science, Household Science, Dentistry and Music; and departments of Social Work, Public Health, Physical Education, Library Work and Graduate Nursing. It maintains also a Graduate School, Summer School and University Extension. Three theological colleges are connected with McGill: the Diocesan College of Montreal, Presbyterian College and United Theological College. Affiliated institutions are Acadia, Alberta, Mt. Allison and St. Francis Xavier universities. In 1931-32 the university enrolled 3,059 students and had a faculty of 478 members, headed by Sir ARTHUR W. CURRIE, Principal. Its productive funds in 1931, including those for Royal Victoria College and MACDONALD COLLEGE, totaled $17,111,221. The library contained approximately 400,000 volumes.

McKAY, DONALD (1810-80), American shipbuilder, was born Sept. 4, 1810, in Shelbourne, Nova Scotia. Learning the trade of shipbuilding in 1840, he established himself in that trade at Newburyport, Massachusetts. His name is remembered for the fast clipper ships designed and built in his East Boston shipyards. His "Flying Cloud," which set a record of 89 days from New York to San Francisco, around Cape Horn, was his most notable design. He died at Hamilton, Mass., Sept. 20, 1880.

McKEESPORT, a city and port of Allegheny Co., Pa., at the junction of the Monongahela and Youghiogheny rivers, 15 mi. southeast of Pittsburgh. It is

served by the Baltimore & Ohio, the Pennsylvania and the Pittsburgh & Lake Erie railroads, motor bus lines and two nearby airports. Belonging to the greater Pittsburgh industrial district, McKeesport manufactures primarily iron and steel, tubing, tin plate and other metal products, valued annually at about $100,000,000. In 1929 the retail trade amounted to $29,789,264. David McKee instituted a ferry here in 1769, and 26 years later his son John planned and laid out the town. Coal, first mined in 1830, and gas are found; during the 1850's boat building was important. The borough was established in 1842, the city chartered in 1891, and a commission government was adopted in 1913. Braddock's defeat in 1750 took place at Braddock, 5 mi. distant. Pop. 1920, 46,781; 1930, 54,632; 20% were foreign-born and 5% were Negroes.

McKEES ROCKS, a coal-mining and manufacturing borough in Allegheny Co., southwestern Pennsylvania, situated on the Ohio river opposite Pittsburgh. River craft, passenger service by two railroads and freight service on four lines serve the borough. There are large railroad shops. The chief local manufactures are iron, steel, tin, springs and enamel products. In 1929 the manufactured output was worth about $24,000,000; the retail trade amounted to $7,734,828. The vicinity has natural gas wells. McKees Rocks was founded in 1830. Pop. 1920, 16,713; 1930, 18,116.

McKENNA, REGINALD (1863-), British statesman and financier, was born in London, July 6, 1863. He was educated at Kings College, London, and at Cambridge, and was called to the bar in 1887. Entering parliament in 1895, he later filled a number of important offices. As chancellor of the exchequer during the World War, it was his duty to raise the money to carry on the war. In 1916, he retired from political life and became prominent in the banking circles of London.

McKENZIE, a town in Carroll Co., northwestern Tennessee. It is situated 117 mi. west of Nashville and is served by bus lines and two railroads. The chief crops of the vicinity are cotton, corn and sweet potatoes. McKenzie is the seat of Bethel College, organized in 1842, coeducational, and the McTyeire School for boys. McKenzie was settled in 1850 and incorporated in 1869. Pop. 1920, 1,630; 1930, 1,858.

McKIM, CHARLES FOLLEN (1847-1909), American architect, was born August 24, 1847, in Chester County, Pa. He studied at Harvard University and at the École des Beaux-Arts, Paris. Returning to the United States, he formed a partnership with Stanford White and William R. Meade. His work gave impetus to the evolution of a style of American architecture, suitably combined with Renaissance and classic lines. McKim had an important share in designing the Pennsylvania Railway Station, the Morgan Library, the Library and other buildings of Columbia University, the old Madison Square Garden, the Hall of Fame, and the Bowery Savings Bank, all in New York City, the Boston Public Library, the Agricultural Building for the Columbian Exposition at Chicago (1893), and he contributed to the modern city-planning projects of Washington, D.C. He was one-time president of the American Institute of Architects, and a founder member of the American Academy in Rome. McKim died September 14, 1909, at St. James, L. I.

McKINLEY, WILLIAM (1843-1901), 24th President of the United States, was born at Niles, Trumbull Co., O., Jan. 29, 1843, the seventh in a family of nine children. His paternal ancestors were Scotch-Irish, and his great-grandfather saw service in the Revolutionary War. His father, William McKinley, was an iron manufacturer, who in 1829 married Nancy Campbell Allison. In 1852 the family moved to Poland, in Mahoning Co., where the future President was entered at Union Seminary. During 1860-61 he was a student in Alleghany College at Meadville, Pa., but poor health forced him to curtail his studies. Young McKinley found less strenuous employment teaching school in a neighboring county, and in this work he continued until the outbreak of the Civil War. In 1861 he enlisted as a private in the 23rd Ohio Volunteers, and after his first battle at South Mountain and Antietam in 1862, he won a commission as second lieutenant. The following year he was promoted to first lieutenant, in 1864 to captain, and in 1865 to brevet major. His last military post, after a career which included fighting at Lexington, Winchester, and Cedar Creek, all in 1864, was that of acting adjutant-general on the staff of Gen. S. C. Carroll. Mustered out in 1865, McKinley began to study law, attending the Albany (N.Y.) Law School. In 1867 he was admitted to practice at Warren, O., and opened an office at Canton.

During the war McKinley had served on the staff of Gen. Rutherford B. Hayes, who had aroused his aide's interest in politics. He entered the Grant campaign of 1868 with enthusiasm, and in the following year was elected Prosecuting Attorney of Stark Co., O. In 1871 he married Ida Saxton. His oratorical talent was used to advantage in 1875 by the managers of Hayes' campaign for the Ohio governorship. His vigorous addresses popularized him throughout the state, and in 1876 he was elected to Congress from the 17th Ohio District. McKinley remained in the lower house until 1883, and served again in 1885-90. In this period, the Ohio representative became known as the spokesman of the new industrial element in the country, and as such he labored unceasingly for a high tariff to protect manufacturers. In 1880 McKinley's growing power in the house was extended by his appointment to the Ways and Means Committee. He was in part responsible for the defeat of the Democratic tariff of 1884, in 1889 became chairman of the aforementioned House committee, and the same year was acknowledged as Republican leader in the House. At this point he was a pillar of the party, but the so-called McKinley Tariff Bill in 1890, which was formulated under his guidance and enacted by the 51st Congress, led to the Republican defeat of

the same year. Prophecies of excessive living costs and of reduced governmental revenues by the Democrats won for them Congressional elections, defeating even McKinley. He was not long without public office, being elected Governor of Ohio in 1891, and re-elected in 1893. As the 1896 convention approached, he appeared to many party leaders as the most suitable presidential candidate. The delegates, skilfully manipulated by Marcus A. Hanna, nominated him on the first ballot at the St. Louis convention. The Republican platform endorsed the "gold standard" in opposition to the "free silver" issue of the Bryan Democrats, and McKinley won the election by an electoral vote of 271 to 176. He took office in March, 1897.

McKinley upon his inauguration summoned a special session of Congress to revise the tariff. Congress met on Mar. 15, 1897, and rapidly passed the Dingley Tariff which had already been partially drawn by the preceding Congress, establishing the highest tariff rates in the history of the country. The most important event in this administration was the Spanish War in 1898. Relations had already become strained between Spain and the United States before McKinley's inaugural as a result of the severity of Spanish treatment of her revolting colony, Cuba. In June, 1897, the United States protested to Spain and conditions seemingly improved when American indignation was fanned to war heat by the publication in Feb., 1898, of a letter from De Some, Spanish Minister to the United States, in which he insultingly alluded to McKinley and by the blowing up of the American battleship *Maine* in Havana Harbor. McKinley on Mar. 9 sent an ultimatum to Spain demanding abandonment of the Reconcentrado policy in Cuba and the establishment of an armistice in the island. Spain complied with the first at once and delayed the second until McKinley was informed on Apr. 10 by the American Minister to Spain that the second would be granted. McKinley's war message had already been written and despite the new information, he delivered it to Congress the following day, Apr. 11. For this McKinley has been severely criticized as contradicting his statement that he had "exhausted every effort to relieve the intolerable condition of affairs." War was formally declared Apr. 24, 1898. By the terms of the peace treaty Spain evacuated Cuba and ceded Porto Rico, Guam, and the Philippine Islands to the United States. Inclusion of the Philippine Islands in the treaty at McKinley's direction met with mingled approval and disapproval by the nation as did his firm suppression of a subsequent insurrection in the islands. In 1897 McKinley submitted a treaty to the Senate providing for annexation of the Hawaiian Islands. The treaty was not ratified but the islands were annexed by Congressional resolution in 1898.

At the start of his second term McKinley concerned himself chiefly with instituting civil government in Cuba and the Philippines. He made an extended tour of the nation as far as the Pacific Coast. His cordial reception in the South was hailed as a sign of the end of sectional hostility. On Sept. 6, 1901, while attending a reception in the Music Hall at the Buffalo (N.Y.) Pan-American Exposition, he was shot by Leon Czolgosz, an anarchist, and died at Buffalo, Sept. 14, 1901. The day before his assassination he made a memorable last speech at Buffalo in which he partially rescinded some of the emphasis of his protectionist doctrines and urged a modification of the tariff in the interest of world concord and prosperity. He was buried in the Canton (Ohio) Cemetery. McKinley had two daughters. He was a Methodist.

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McKINLEY, MOUNT, the highest peak in North America, situated in the coast range of Alaska. Its summit rises 20,300 ft. above sea level from a base having an elevation of only about 1,500 ft., thereby giving its slopes a greater rise than any others in the world. The last 1,500 ft. of the mountain is a pack of permanent snow and ice from which many large glaciers issue. Some of these glaciers on the southern face are 30 to 40 mi. long and rush at a violent speed down the steep, forbidding slope. The northern or interior slope is less precipitous and is approached through foothills where the Indians hunt the caribou. These natives named the peak Denali, the great one, and call Mt. Foraker nearby Denali's wife. The name McKinley was given it by W. A. Dickey, a traveler in Alaska in 1896, in honor of the newly elected United States President. Many attempts were made to reach the topmost summit before it was finally accomplished in June 1913 by Hudson Stuck, H. P. Karstens and Robert Tatum. In May 1932 Harry J. Leik, superintendent of the Mt. McKinley National Park, and his party made the first successful attempt to climb both peaks of the mountain.

McKINLEY MEMORIAL at Canton, Ohio, a national shrine erected in 1907 on a high elevation in West Lawn cemetery, in which President William McKinley and his wife are buried. The mausoleum is a circular granite structure, 75 ft. in diameter, rising 97 ft. above the base, designed by H. Van Buren Magonigle. On the great stairway of the main approach is a bronze statue of the President by Charles H. Niehaus.

McKINLEY TARIFF ACT, Oct. 1, 1890, a bill notable in its provision for a bounty on sugar produced within the United States, and for its recognition of commercial reciprocity. The tariff act, drafted by the Ways and Means Committee of the House, of which WILLIAM MCKINLEY was chairman, from a Senate bill of the previous session, was strongly protectionist. Both branches of Congress at the time had Republican majorities. The free list was extended to include commodities which did not compete with domestic production; duties on agricultural products were increased; protection was affirmed in increased duties upon fabrics, textile materials, cutlery, tin-plate and other articles. The reciprocity policy was designed especially to open to our products the markets

of South American countries, and was doubtless an indirect effect of the first Pan-American Congress, held in Oct. 1889. The president was empowered to levy duties by proclamation on sugar, molasses, tea, coffee and hides, if any country exporting these commodities imposed duties upon United States produce.

McKINNEY, a city and the county seat of Collin Co. in northeastern Texas, situated 32 mi. northeast of Dallas. Bus lines, the Texas electric railway and two railroads serve the city. Cotton, corn and small grain are the chief crops of the district. Cotton and cottonseed products are manufactured and there are flour and feed mills and a grain elevator. The city is a market and shipping center for live stock, grain and cotton. McKinney was incorporated in 1846. Pop. 1920, 6,677; 1930, 7,307.

McLAUGHLIN, ANDREW CUNNINGHAM (1861-), American historian and university professor, was born at Beardstown, Ill., on Feb. 14, 1861. He graduated in 1882 at the University of Michigan, where he was instructor in Latin, 1886-87, and professor of American history, 1891-1906. For two years, 1903-05, he was director of the Bureau of Historical Research at Carnegie Institution in Washington. From 1906 to 1929 he was professor of history at the University of Chicago, and head of the history department until 1927. He served as associate editor of the *American Historical Review,* 1898-1914, and as managing editor, 1901-05. In 1914 he was president of the American Historical Association. McLaughlin's chief contributions to American history are to be found in his scholarly and illuminating writings on the legal aspects of the development of the nation. His works include: *Lewis Cass* (American Statesmen Ser.); *Confederation and Constitution* (The American Nation: A History); *Courts, the Constitution and Parties; America and Britain;* and *Steps in the Development of American Democracy.* He edited, with Prof. A. B. Hart, the *Cyclopedia of American Government,* in three volumes.

McMASTER, JOHN BACH (1852-1932), American historian and university professor, was born in Brooklyn, N.Y., June 29, 1852. He graduated in 1872 at the College of the City of New York, where he became instructor in English the same year. In 1873 he turned to the practice of civil engineering, and in 1877-83 was instructor in civil engineering at Princeton. He was made professor of American history at the University of Pennsylvania in 1883, becoming professor emeritus in 1920. He served as president of the American Historical Association in 1905. McMaster's principal work is the *History of the People of the United States, from the Revolution to the Civil War,* in eight volumes. The title was chosen deliberately, the emphasis being placed on the economic and social rather than the political aspects of history. In his introduction the author states: "The history of the people shall be the chief theme." For his source materials, he depended largely on contemporary newspapers, broadsides and pamphlets. Unfortunately his work is lacking in interpretation of the great mass of data which he presents. Other works are *Benjamin Franklin* (American Men of Letters series); the *United States in the World War;* and chapters 9, 11 and 12 in vol. 7 of the *Cambridge Modern History.* McMaster died May 24, 1932, at Darien, Conn.

McMASTER UNIVERSITY, at Hamilton, Ont., Canada, a coeducational institution, was established in 1887 at Toronto, when the Toronto Baptist College and Woodstock College, Woodstock, were united and their already existing endowments increased by a bequest of $900,000 from the Hon. William McMaster. The institution is non-sectarian, though affiliated with the Baptist Church. It was transferred to Hamilton, Ont., in 1930. There are 32,000 volumes in the library. In 1931-32 there were 700 students, and a faculty of 40 headed by Pres. H. P. Whidden.

McMURRY, FRANK MORTON (1862-), American educator, was born in Crawfordsville, Ind., July 2, 1862. He was educated at the universities of Michigan, Halle and Jena. From 1883-90 he was principal of schools and from 1890-1908 professor of pedagogy at several universities. From 1908-26, McMurry was professor of elementary education at Teachers College, Columbia University. He is the author of many educational works and coauthor of the Tarr and McMurry geographies.

McMURRY COLLEGE, a coeducational institution founded at Abilene, Tex., in 1922, which also has a preparatory department. In 1930 there were 450 students enrolled and a teaching force of 99, headed by the Rev. James Winford Hunt, founder.

McNARY-HAUGEN PLAN. The first plan (1924) called for determining for each of the major agricultural products a ratio-price, i.e., a price which was to be in the same ratio to the general level of prices as the ratio prevailing before the World War. When the price fell below that point, a Federal board was to buy enough of the product to bring the price back to the ratio-price level, and to sell such surpluses abroad at whatever price it could get. Purchases were to be financed from a revolving fund, provided by Congress, which was to be replenished by sales of scrip to buying agencies. These would use the scrip as part payment to growers. Such scrip would later be redeemed at a price representing the difference between its face amount and its proportionate share of the losses incurred on foreign sales of the product. In subsequent forms of the bill, the ratio-price feature was dropped, and the stated objective became that of making the tariff effective. Losses were to be made good by the collection of an equalization-fee from transporters or processors. The plan had strong support among farm organizations and in political circles representing the Middle West. In 1927 and again in 1928 it was passed by Congress and vetoed by President Calvin Coolidge. In the early part of the Hoover administration it was supplanted by the Agricultural Marketing Act. But considerable sentiment for some form of the McNary-Haugen plan still exists. J. D. B.

McPHERSON, a city in central Kansas, the county seat of McPherson Co., situated 35 mi. south of Salina. Bus lines and four railroads make the city a shipping center for oil and grain. McPherson has grain mills and truck-body and cigar factories. It is the seat of McPherson College and of Central Academy and College. The locality is associated with Coronado, and is near the old Santa Fe Trail. McPherson was founded in 1872. Pop. 1920, 4,595; 1930, 6,147.

McREYNOLDS, JAMES CLARK (1862-), American jurist, was born at Elkton, Ky., Feb. 3, 1862. He was graduated from Vanderbilt University in 1882, studied law at the University of Virginia, and began law practice in Nashville, Tenn. During 1903-07 he was assistant Attorney-General of the United States, and was Attorney-General in the cabinet of President Wilson in 1913-14. He was appointed an associate justice of the Supreme Court of the United States in Aug. 1914.

M'CULLOCH VS. MARYLAND, 1819, a case involving the interpretation of the United States Constitution, which led to a notable decision by the United States Supreme Court. The State of Maryland enacted a tax upon the notes issued by all banks not chartered by the state legislature. M'Culloch, cashier of the Baltimore branch of the Bank of the United States, a Federal institution, resisted enforcement. Judgment against him was upheld by the highest court of Maryland, and M'Culloch appealed to the United States Supreme Court on the ground that the state act was invalid. Chief Justice Marshall, delivering the verdict, upheld the right of Congress to incorporate a bank and declared that the act of the Maryland legislature in assessing a tax against the notes issued by the Bank of the United States was an abridgment of the powers of Congress, therefore unconstitutional and void. The verdict expressed the conviction "that the states have no power, by taxation or otherwise, to retard, impede, burden, or in any manner control, the operations of the constitutional laws enacted by Congress to carry into execution the powers vested in the general government. This is, we think, the unavoidable consequence of the supremacy which Congress has declared." This phraseology has become the classic expression of the doctrine of broad, or liberal, construction of the Constitution.

McVEY, FRANK LeFOND (1869-), American educator, was born in Wilmington, O., Nov. 10, 1869. He was graduated from Ohio Wesleyan University, 1893, and from Yale, 1895. After a year as instructor at Teachers College, Columbia University, he served for eleven years on the economics faculty, University of Minnesota. From 1909 to 1917 he was president of the University of North Dakota and was elected president of the University of Kentucky in 1917. He is the author of several books.

MDEWAKANTON, a sub-tribe of the DAKOTA Indians, which with the Sisseton, Wahpeton and Wahpekute comprises the Santee division of that tribe.

MEAD, GEORGE HERBERT (1863-1931), American philosopher, was born at South Hadley, Mass., Feb. 27, 1863. He graduated from Oberlin College in 1883 and for four years was a private tutor. In 1888 he took the Harvard A.B. and the following three years studied at Leipzig and Berlin. From 1891-94 he was a teacher of philosophy in the University of Michigan. Going to the University of Chicago in 1894 as assistant professor, Mead became a full professor there in 1907. In 1929 he was made chairman of the department of philosophy, a position he held until his death. In 1930 he gave the third of the Carus lectures at the University of California. Mead made contributions to the history of scientific method, stressing in particular the rôle of the individual thinker, and in his social psychology made much use of the significant symbol. He died in Chicago, Ill., Apr. 26, 1931.

MEAD, WILLIAM RUTHERFORD (1846-1928), American architect, was born in Brattleboro, Vt., Aug. 20, 1846. After his graduation from Amherst College in 1867, he took up the study of architecture, working under Russell Sturgis in New York and going abroad to perfect his education. He began to practice his profession in 1872 in association with Charles F. McKim in New York. In 1879 the firm was augmented by Stanford White and became McKim, Mead and White, one of the foremost architectural firms in the United States. Buildings designed by this trio include the National City Bank, Columbia University, College of the City of New York, Tiffany Building, Bellevue Hospital, Madison Square Garden, Pennsylvania Station, United States Post Office, and Municipal Buildings, all in New York City; the Boston Public Library; University of Virginia; Rhode Island Capitol; and the War College at Washington. Mead died at Paris June 30, 1928.

MEADE, GEORGE GORDON (1815-72), American soldier, was born at Cadiz, Spain, on Dec. 31, 1815. He was graduated at the United States Military Academy in 1835, and in the three years following served in the Seminole War in Florida. After an interim as civil engineer and surveyor, he reentered the army in 1842 as a second lieutenant of topographical engineers, and saw action in the Mexican War. After the war he supervised river and harbor works and the building of lighthouses, and superintended the survey of the northern lakes. He was promoted to a captaincy in 1856. Upon the outbreak of the Civil War, Meade was commissioned a brigadier-general of Union volunteers, and given command of the 2nd brigade of the Pennsylvania reserve corps in the Army of the Potomac. The same year he was promoted to major of engineers, and after distinguishing himself at the battles of Manassas, South Mountain, and Antietam, was made major-general of volunteers. At Fredericksburg his command penetrated Lee's right. Meade succeeded Hooker in 1863 as commander of the Army of the Potomac. On July 1-3 he won the battle of Gettysburg for which he received the thanks of Congress.

He was made major-general in the regular army in 1864. Meade died at Philadelphia, Pa., on Nov. 6, 1872.

MEADOW BEAUTY (*Rhexia virginica*), an elegant perennial herb of the melastoma family called also handsome Harry and deer-grass. It is found in sandy swamps from Maine to Iowa, ranging southward to Louisiana. The stoutish, somewhat hairy, square stem, about a foot high, bears opposite, oblong, minutely toothed leaves and a terminal cluster of bright purple flowers, an inch or more across.

MEADOWLARK, a genus (*Sturnella*) of American song birds belonging to the same family (*Icteridæ*) as the bobolink and the blackbirds. There are three species, all about the size of a robin. The plumage is generally brownish above, streaked and barred with black, and yellow below, with a black crescent on the breast. They are social birds, usually going in small flocks and frequenting meadows and fields. Their food consists mostly of harmful insects, as cutworms, army worms and boll weevils, but includes also weed seeds and grain. Meadowlarks commonly place their nests, which are usually arched over, in a tuft of grass on the ground, and lay three to seven somewhat speckled white eggs. In the autumn and winter, when they become very fat, meadowlarks were formerly shot as game birds, but they are now protected by law throughout the year. The eastern meadowlark (*S. magna*), ranging from Minnesota to Texas and eastward, and represented by subspecies as far south as Venezuela, is nearly 11 in. long and has a clear, exceedingly sweet song. The western meadowlark (*S. neglecta*), somewhat lighter in color and having the yellow extending on to the cheeks, has a very different song consisting of loud ringing, flute-like notes; it is found from Wisconsin to Texas and westward to the Pacific. The third species is the Cuban meadowlark.

MEADOW-SWEET, the name given in eastern North America to native species of *Spiræa,* small, profusely flowering shrubs of the rose family. The American meadow-sweet (*S. latifolia*), with reddish-brown stems, 2 to 6 ft. high, oblong, coarsely toothed leaves and white or pinkish flowers, is common in rocky pastures from Newfoundland to Saskatchewan and southward to Virginia. The similar narrow-leaved meadow-sweet (*S. salicifolia*), with yellowish-brown stems, finely toothed leaves and white flowers, grows in low grounds from Ontario to Saskatchewan, southward to North Carolina and Missouri.

MEADVILLE, a city in northwestern Pennsylvania, the county seat of Crawford Co., situated on French Creek, 36 mi. south of Erie. Buses and two railroads afford transportation. The city is a trade center for a rich farming region. It has railroad shops and factories producing tools, boilers, hookless fasteners, rayon and visual education equipment. The manufactured output, 1929, was worth $11,977,143. In 1929 the retail business reached a total of $11,941,430. The city is the seat of Allegheny College and the Pennsylvania College of Music. Meadville was founded in 1793; it became a borough in 1823 and a city in 1866. The city lies in the foothills of the Allegheny Mountains in the midst of splendid scenery. Pop. 1920, 14,568; 1930, 16,698.

MEAL WORM, a popular term for the larvæ of various moths and beetles which feed on stored and ground grains and the products made from them. Cereal foods and crackers are frequently infested. The Mediterranean flour moth, the Indian-meal moth, and the meal snout-moth injure more food than they consume because they make silken webs in the meal. In homes and warehouses they may be destroyed by heating at 120° for six hours or by poisonous gases; in homes their attacks may be prevented by storing meal in tight containers and leaving no food within their reach.

MEALY BUG, a popular name for various insects of the order *Homoptera,* family *Coccidæ.* They are characterized by white, waxy secretions covering their bodies. The females are slow moving, wingless creatures found on plants in greenhouses and residences and on citrous fruits in the South. In Louisiana the sugar-cane mealy bug works in clusters on the roots, crowns and stalks of sugar-cane and Johnson grass. With the former they are transferred to new fields. Crop rotation combined with washing the seed cane in whale oil soap solution and burning cane remnants and Johnson grass are control measures. For other species soapy and oily contact insecticides applied with force are effective.

MEANDERS, winding curves cut by streams in their flood plains. Obstructions readily deflect a gentle current, causing it to swing from side to side,



COURTESY AMER MUS OF NATL HISTORY

MEANDERS OF THE JHELUM RIVER, CASHMERE, INDIA

cutting ever wider curves in its banks. The meandering lower Mississippi travels 1,000 miles between the mouth of the Ohio and the Gulf, a straight distance of 600 miles.

MEASLES, an acute infectious disease that occurs for the most part in temperate climates. It seems to be the most contagious of all fevers, and takes from 7 to 14 days to show after exposures. No age is immune, few pass through childhood without having had measles.

Measles begins with all the symptoms of a severe cold. There is a watery discharge from the nose, redness and watering of the eyes, cough and often hoarseness. The symptoms usually begin suddenly and the temperature is usually about 102° F.

On the second and third day these symptoms in-

crease in severity and Koplik's spots appear. (*See also* MOUTH, DISEASES OF.) These are minute white spots, surrounded by a red area, found on the lining membrane of the mouth. The diagnosis of measles can be based on the finding of these spots. On the fourth day, the eruption of measles occurs, and the Koplik spots usually disappear.

The rash appears first on the temples and forehead. It spreads rapidly and in a few hours is found on the face and trunk and finally on the limbs. At first the rash resembles flea-bites. Then it becomes irregular, blotchy and dusky red in color. It fades with cold and becomes more noticeable with warmth. It usually lasts three or four days, and rarely as long as six days. Following the disappearance of the rash, there is some peeling in the form of fine branny scales.

With the appearance of the rash, the fever rises to its highest point, usually about 104° F. The discharge from the nose, cough and other symptoms last until about the sixth day and then begin to disappear.

If there are no complications, recovery takes place rapidly. The most common complications are bronchitis and bronchopneumonia. Bronchopneumonia is serious and is responsible for most of the deaths that occur from measles. Infection of the middle ear, or otitis media is also a frequent complication, while brain inflammation or encephalitis occurs but rarely. The latter, however, is often fatal. Severe infection of the lining membrane of the cheek, with ulceration, known as noma is always a fatal complication.

Measles causes more deaths in childhood than all the other infectious fevers together. The percentage of deaths is greater during the second year. In general, the mortality is about 3% of those infected.

The germ that causes measles has not yet been absolutely identified. The most recent investigations seem to indicate that it is caused by some type of streptococcus. The germs are found in the blood of the one who has the disease as well as in the secretions from the nose and throat. The disease is transmitted by direct contact, often through the droplets of moisture coughed or sneezed out.

It has recently been found that blood serum taken from an individual who has just recovered from measles has protective and curative value for measles. The amount of serum used is about 6 cubic centimeters for children under three years of age and 6 to 10 cubic centimeters for older persons. The serum is injected deep into a muscle.

The treatment of measles aims at the avoidance of complications, the relief of symptoms and the prevention of spread of the infection. The temperature of the bedroom should be about 68° F. The light should be moderated, because of the eye pain that bright light causes. Sponging may be used for high temperatures.

One attack of measles usually protects against further attacks. W. I. F.

MEASURE, in music, a metrical unit defined by vertical lines drawn through the staff. These lines, called bars, are popularly identified with the measure which they delimit, but such an identification of bar and measure is preferably avoided since bars are not measures but only their terminal points. Save for marking vocal pauses, bars were not used prior to 1600, although as early as 1100 the relative time-value of notes began to be elaborated, albeit crudely. For details of metrical music *see* MODE; NOTATION.

MEASURE, UNITS OF (including weight, the measure of attraction of gravity), have developed slowly from ancient times. Being akin to the folklore and the language of all countries, the names tend to remain long after better units are suggested. Thus the cubit, in ancient times usually about 20.5 inches or more, is still referred to in our literature, and the use of the grain is only now being abandoned. The troy weight, introduced from the fairs held at Troyes, France, as early as the 13th century, has only recently been given up for general purposes and the avoirdupois (*aver de poiz, haberdepoise*) became popular only in the 16th century. For measuring length, the foot was used long before the Christian era. In England in the Middle Ages the thumb, span, cubit, ell, pace, furlong (furrow long), yard (*gyrd*, a stick), rod (rood), league and mile (*mille passuum* or *passum*, 1000 paces or double steps) were all used, the units varying according to the standards in different cities.

The United States early adopted the British standards and kept them even after Great Britain altered them. Thus we use the old English wine gallon of 231 cu. in., and the Winchester bushel of 2150.42 cu. in., although England now uses the Imperial gallon of 277.274 cu. in., and the bushel of 2218.192 cu. in. The following are the units most commonly used in the United States at present, the familiar abbreviations being given:

Length. 1 ft. = 12 in.; 1 yd. = 3 ft.; 1 rd. = 16½ ft.; 1 mi. = 320 rd. = 5280 ft.
Area. 1 sq. ft. = 144 sq. in.; 1 sq. yd. = 9 sq. ft.; 1 sq. rd. = 30¼ sq. yd.; 1 acre = 160 sq. rd.; 1 sq. mi. = 640 acres.
Cubic Measure. 1 cu. ft. = 1728 cu. in.; 1 cu. yd. = 27 cu. ft.
Weight. 1 lb. = 16 oz.; 1 ton = 2000 lb.; 1 long ton = 2240 lb.
Liquid. 1 qt. = 2 pt.; 1 gal. = 4 qt.
Dry. 1 qt. = 2 pt.; 1 pk. = 8 qt.; 1 bu. = 4 pk.

Among the practical (approximate) equivalents in common use are the following:

1 bu. = 1¼ cu. ft.; 1 bbl. (barrel) = 4.2 cu. ft. = 31½ gal.; 1 cu. ft. = 7½ gal.; 1 cu. ft. of water weighs 62½ lb.; 1 cord of 4-foot wood = 128 cu. ft.; 1 meter = 1.1 yd. = 39.37 in.; 1 kilometer = 0.62 mi.; 1 kilogram = 2.2 lb.

See also WEIGHTS AND MEASURES. D. E. S.

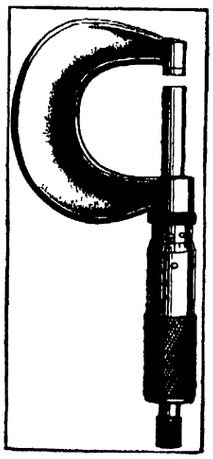
MEASURE FOR MEASURE, a "problem" comedy by SHAKESPEARE, produced in 1604 and based principally on George Whetstone's *Promos and Cassandra*, 1578. The Duke of Vienna deputes Angelo to enforce the old Viennese law that no man shall live with a woman not his wife on pain of death, and goes himself, in the disguise of a friar, to watch the re-

sults. The young Claudio, first to be caught and condemned, is interceded for by his sister, Isabel, the brightest figure of the play. Angelo refuses Isabel's assistance unless she become his mistress, which she refuses to do, until, counseled by the "friar," she at last consents. But by a clever ruse Angelo is made to receive his jilted fiancée, Mariana, instead of Isabel. Claudio is saved from the death sentence, and the play ends happily, the duke marrying Isabel, Angelo Mariana, and Claudio wedding Juliet.

MEASURES AND VALUES, STANDARDS OF. The International Conference on weights and measures in 1875 at Paris approved an act, "The Convention of the Metre," which has been ratified by at least 31 states, establishing the metric system over a large part of the civilized world. The international standards are kept in a Bureau at Sèvres, France. All are based on a measure of distance intended to be one ten millionth part of the earth's quadrant (the distance from a pole to the equator), and called the *mètre* or meter.

In Great Britain, Ireland and the United States both the metric system and the old English system, based on yard, pound, etc., are utilized, the first generally for scientific purposes, the second for commercial. The Russian system is based on the *verst,* roughly a kilometer, and for weight of commercial products, the *pud,* about 40 lbs. Outside of Europe, and even in European localities, diverse systems prevail, some of them archaic and some very crude. The United States Constitution empowered Congress to adopt standards of weights and measures. The first attempt was contained in a memorable report by JOHN QUINCY ADAMS, when Secretary of State. The administration under the American government is entrusted to the Bureau of Standards, Department of Commerce.

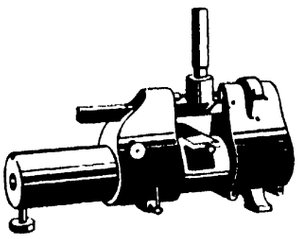
There is no international system of monetary value, each country maintaining its own coinage, but for international transactions, the English pound sterling was long commonly used. Its place has now been partly taken by the American gold dollar, which contains 25.8 grains of pure gold. D. P. B.



MICROMETER

MEASURING TOOLS, devices or instruments for measuring metal products. They range in accuracy from the common two-foot rule to the most highly refined instruments that will show variations claimed to be as small as a millionth of an inch. The wooden rule, however, has little place in the modern shop and is replaced with a steel rule or scale, which can be graduated more accurately and which varies less with atmospheric changes. Calipers of various kinds enable measurements to be transferred with fair accuracy, while MICROMETERS of different designs measure to thousandths and ten-thousandths of an inch.

Measuring tools are made in many designs for convenience and accuracy in measuring manufactured parts. Both internal and external dimensions must be measured as accurately as possible for even average work. A few tools used in standard measurements are illustrated. Highly accurate measuring machines are kept for checking other tools, nearly all of them being based on the use of an accurate screw of fine pitch and finely graduated dials. *See also* COMPARATORS.

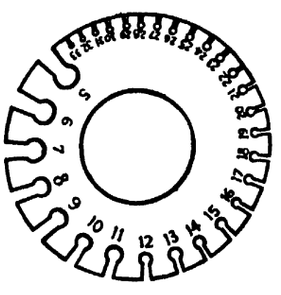


SUPER-MICROMETER
For measuring accurately to .0001 inch

Measuring instruments are also made in which electrical contacts, and light waves, are used to indicate the size of the piece. In both cases large magnification is used so that a very small variation in size will show a large movement on the scale of the instrument. In the electrical instrument three small lamps may be used to indicate the size of the piece being measured. If the piece is within the desired limits the center lamp is lighted, while a large piece lights the one on the left and a small piece the lamp on the right. These lamps can be colored to suit the ideas of the user, but are usually made as follows: green for the right size, red for over size and blue for under size.



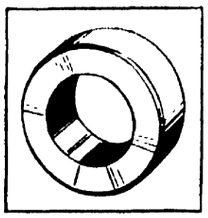
As all metals expand appreciably if the temperature changes but a few degrees, temperature plays an important part in accurate measurements. For this reason a standard temperature is used in checking very accurate instruments, this being 68° F. or 20° C. in most countries. Measuring rooms or rooms where accurate inspection takes place are kept at this temperature. Often the inspection departments of automobile factories are located right in the shop production line, where the work goes through an inspection room that is kept at the proper temperature.



COURTESY CHICAGO APPARATUS CO.
WIRE GAGE

Confusion sometimes arises between the terms, measuring and gaging, as both have to do with the accuracy of a product. Measuring, however, tells the exact size of the piece while gaging only tells whether or not it is of the correct size. Gages are of many kinds, made to check the size of work. They may be plain rings or plugs, or of a shape or form de-

signed to test the accuracy of the piece desired. A ring gage tests the size of a bar. If the bar does not go in, it is too large while if it slips in, the bar is too small. In order to keep bars within certain limits as to size it is common practice to make two ring gages, one known as a "go" gage and the other, a smaller ring, as a "no go" or "not go" gage. Unless the bar will enter the "go" gage it is too large but if it enters the "not go" gage, the bar is too small. In the case of a plug gage for measuring holes the condition is reversed. Here the "go" gage is smaller than the "not go" gage.



CYLINDRICAL RING GAGE

A very useful type of gage that has come into common use is the COMPARATOR by which we compare the form or size of the work with a standard, but do not determine the actual size.

Where extreme accuracy is required, several sets of gages are employed: the "master" gage being kept for checking the other gages while the others are used by the inspector and by the workmen. Precision gages are essential in interchangeable manufacture and form part of the equipment of any plant engaged in mass production. Several types of gages are shown herewith. *See* PRODUCTION, INTERCHANGEABLE; FITS AND TOLERANCES.

COURTESY PRATT & WHITNEY CO.
PLUG GAGE

F. H. C.

MEASURING WORM, a term applied to the larvæ of moths of the family *Geometridæ* and closely related families, called also inch-worms, span worms and loopers. They progress by a series of looping movements. This peculiar method of locomotion is correlated with the lack of abdominal prolegs, except for two pairs at the rear end. When at rest, some of these caterpillars hold the body out stiff and motionless, as though simulating a twig. All feed upon leaves, some being very destructive, especially to the leaves of orchard trees.

MEAT, the dressed, edible flesh of animals, particularly cattle, swine, sheep, goats, fowls, and game. The term "meat," is most accurately used to designate the striated muscle which is skeletal or that of the tongue, heart, or diaphragm. Though meat is applicable in a broad sense to other parts of an animal carcass, the commercial use of the term does not usually include skin, ears, snout, or such organs as the liver or kidneys, even though edible. Minimum limits governing the age and weight of calves and lambs have been established in some states and municipalities, thus placing legal limitations also on the product that may properly be designated meat.

Common usage has resulted in various terms for referring to the meat of the principal classes of food animals. Beef is the meat obtained from cattle nearly a year of age or older. Veal is the meat of calves. Mutton is derived from sheep nearly one year of age or older. Lamb is obtained from young sheep. Pork is the meat of swine. Venison is the flesh from deer.

As contrasted with prepared meats of various kinds, fresh meat is that which has undergone no substantial change in character since the time of slaughter. Methods of preparing meats to improve their keeping qualities or to influence their flavor are smoking, drying, corning, salting, pickling, potting, canning, or similar processes, singly or in combination. These methods commonly involve the use of various curing agents such as salt, spices, sirup, honey, and sugar. Meats likewise enter into many other foods as either a major or minor ingredient, usually to add flavor and food value. Sausage, brawn, scrapple, and meat loaf are typical examples of commercial meat food products.

Meats vary greatly in chemical composition and physical characteristics, thus providing the housewife or cook with the means of preparing menus to meet different nutritive requirements. Being good sources of both protein (*see* PROTEIN IN FOODS) and fat (*see* FATS, ANIMAL ORIGIN), the meat of the principal food animals combines well with vegetables, fruits, and cereal products. The per capita consumption of meat in the United States, in recent years have ranged from about 130 to 150 lbs. annually. This quantity, though not so great as in a few countries where stock raising is a dominant enterprise, is materially above the world average.

J. R. M.

Meat as a Food. Meat is mainly a mixture of protein and fat, with water and a small amount of minerals. It is as a source of protein that meat is primarily important in the diet. Meat proteins are efficient in building and repairing body tissue, but they are not superior to those of milk and eggs.

Associated with the proteins of meat are substances known as "purins," to which part of the flavor of meat is due. These play no part in body building or in supplying energy, but are burned in the body to uric acid and excreted in the urine. Sometimes the kidneys do not excrete this substance as completely as is necessary for health, and, if so, it accumulates in the blood and joints.

The energy value of meat depends, to a large extent, upon its fatness, the fatter the meat, the higher the fuel value but, since many people leave uneaten much of the fat on a piece of meat, a good share of the available energy may be wasted. Lean meat contains fairly large quantities of phosphorus and iron, and relatively smaller amounts of other minerals. It is very poor in calcium. All kinds of meat, except liver and kidney and possibly other organs, are poor sources of vitamins. *See* VITAMINS IN FOODS.

Meat is usually completely and rather quickly digested, the time required for different kinds of meat to leave the stomach varying considerably because of differences in degree of fatness, method of cooking and thoroughness of mastication. The extractives of meat, which include the purins and other substances, stimulate appetite and the flow of gastric juice, thereby aiding digestion.

Meat is called an acid-forming food, because, as it burns in the body, the sulphur and phosphorus in its proteins (*see* PROTEINS IN FOODS) are oxidized to sulphuric and phosphoric acids. The proteins of meat are more liable to be attacked by certain forms of bacteria in the intestinal tract, causing intestinal putrefaction, than are those of milk and vegetables.

Veal, beef, lamb and pork hearts are used as food, preference being given usually to veal and lamb. Because it is one of the tougher cuts of meat, heart requires long cooking to soften the fibers. Like all meat, it is most important as a source of protein. It contains more vitamins than ordinary muscle meats.

H. T. B.

BIBLIOGRAPHY.—H. C. Sherman, *Food Products;* H. C. Sherman, *Chemistry of Food and Nutrition;* A. E. Leach, *Food Inspection and Analysis.*

MEAT BY-PRODUCTS. Though domestic food animals are raised principally for their edible flesh, their dressed carcasses commonly constitute only from 50 to 75% as much as the live weight. The remainder consists of feet, blood, internal organs, internal fat, other offal, and, except in the case of the hogs, the head and hide. Hogs are usually dressed, after being dehaired, with the head and hide left on.

In the early days of the livestock and meat packing industry the class of products mentioned was largely wasted, but with increasing competition and market values their utilization in recent years has become more and more complete. Meat by-products valued for human food include brains, hearts, livers, kidneys, leaf lard, tongues, tails, and numerous less familiar parts. Certain intestines are used as sausage containers. Portions of the stomach are known commercially as tripe. Head meat is used for SCRAPPLE, SAUSAGE, and numerous food specialties. Pigs' feet, after careful trimming and cleaning, are considered a delicacy by many persons. The bones and hide stock of young animals yield GELATIN.

The wide range of meat by-products and their preparation on a small as well as a large scale preclude definite classified information on the quantities and values of these commodities. But the figures are probably very large, judging from available data on lard and sausage production. The estimated annual production of lard in the United States, for the five years ended 1930, averaged about 2,500,000,000 lbs. Sausage production during the same period is estimated to be at least 750,000,000 lbs. annually. The total quantity of meat by-products is obviously a material contribution to human nutrition as well as an important economic saving from the standpoint of the livestock and meat industries.

J. R. M.

MEAT-PACKING INDUSTRY, UNITED STATES. In value of products this industry ranks among the foremost manufacturing enterprises of the country. The industry comprises establishments engaged in wholesale slaughtering and meat packing, including abattoirs devoted to custom slaughtering.

According to the Census of 1930 the chief items of output were: fresh meat valued at $1,780,842,559; cured meat, $748,418,116; sausage, $201,623,004, and lard, $248,007,633. The fresh meat output included beef 4,575,491,960 lbs. valued at $859,802,873; pork 3,571,276,745 lbs., $603,537,342; mutton 601,718,832 lbs., $145,416,001, and veal 511,102,745 lbs., $107,196,896. Besides the foregoing the output also includes various by-products, as glue, hides, sausage casings and fertilizers.

MEAT PACKING, U.S., 1929

Division	*No. Establishments*	*Wage Earners*	*Wages $*	*Value of Products $*
United States	1,277	122,505	165,867,420	3,434,654,098
LEADING STATES:				
Illinois	79	29,618	40,382,248	760,872,847
Kansas	28	9,068	11,822,936	273,586,689
New York	122	7,278	11,822,718	247,425,951
Iowa	24	8,663	10,453,050	244,725,776
Nebraska	15	6,037	7,857,173	208,994,805
Minnesota	16	6,936	9,058,252	201,155,942
Missouri	49	5,614	7,594,542	180,939,544
Ohio	120	5,825	8,265,999	163,155,787
California	94	3,858	6,084,433	139,049,822
Pennsylvania	132	5,232	7,883,980	132,783,116

MEAT TRADE. With the advent of refrigeration and the development of transportation the meat producing regions of the United States spread throughout the country, having been previously located only near centers of consumption. Consequently, production developed beyond local needs and in 1876 export trade was established. It grew steadily and in the early part of the 20th century the United States was furnishing one-third of the world's supply of meat. Increased population has since increased the consumption at home and now Argentina, Australia, New Zealand and Uruguay are the leading meat exporters. In the United States average meat consumption in normal times is about 137 pounds per capita per year. Under the Tariff Act of 1930 imports of livestock and meats are taxed more than in previous years, the rate varying between 2 cents per pound on hogs to 8 cents on poultry.

MECCA, a city of Arabia and chief holy city of the Mohammedan world. The population exclusive of pilgrims is estimated at 85,000. Mecca depends for its existence on pilgrims and the great annual pilgrimage to Mecca is a feature of the greatest importance. The annual influx is estimated at between 100,000 and 500,000. The passage of visitors is the occasion of much trading but is also the chief cause of the spread of epidemic diseases here. The pilgrims follow four main routes: from Damascus to Mecca; from Cairo and Sinai and Yambo; from Baghdad through the heart of Arabia via the oasis of Ha'il; and by sea to the port of Jiddah.

MECHANIC, a person with a practical turn of mind, who is capable of working skillfully and deftly with tools to assemble, disassemble or repair machinery or structures of various types. The mechanic is not concerned with engineering design, but merely

with the proper functioning of machinery or its parts and with the best ways of putting the parts together so that they will give the service expected of them. It is necessary that he possess only fair physical strength, but he should have a developed judgment of mechanical methods so that his work may be accomplished accurately in a minimum of time. The monetary rewards are generally not high, but the knowledge gained of special machinery may lead to well paid positions.

MECHANICAL ENGINEER, a technically trained and educated person whose profession is concerned with the fields of mechanical power, machinery, transportation and production. His functions include those of invention, research, design, construction, operation, maintenance, administration and management. His professional knowledge is based on the mathematical, physical, economic and social sciences, the properties of materials and the technologies of the industries. He may practice as a consulting engineer, usually specializing in some one or more of the major divisions of his profession, but he is more generally employed by an industrial or engineering firm.

The formal education of the mechanical engineer is generally received at engineering and technical colleges, supplemented by practical training in the shop, the drafting room and in engineering offices. Statistics show that, at 15 years after graduation, 75% of the men trained as engineers are engaged in administrative duties. C. W. R.

MECHANICAL EQUIVALENT OF HEAT, the number of units of mechanical energy equivalent to one unit of HEAT energy. The values accepted for this at present are: 1 gram CALORIE (17° to 18° C.) equals 4.185 joules; 1 kilogram calorie equals 426.7 kilogram-meters; or 1 BRITISH THERMAL UNIT equals 777.9 foot-pounds at sea level, latitude 45°. Stated in less technical language, the amount of heat energy necessary to raise the temperature of one pound of water one degree Fahrenheit, if converted without loss into mechanical energy, is sufficient to lift 778 lbs. one foot.

It is now realized that this exact, numerical equivalence between heat and mechanical or other forms of energy is a necessary consequence of the fundamental principle of conservation of ENERGY. But until the experiments of RUMFORD and DAVY at the end of the 18th century, which indicated that mechanical work could be converted into heat, scarcely anyone dreamed of such an exact relationship. Even then, it was not until the investigations of JOULE, more than 40 years later, that the real nature of heat as a form of energy was fully recognized.

Joule made the first accurate experimental determinations of this important physical constant. In one of the most direct of Joule's experiments, water contained in a calorimeter (*see* CALORIMETRY) was churned by paddles which were driven by falling weights. The heat produced was found from the rise in temperature of the water, by a regular calorimetric calculation. The mechanical energy expended was measured by the weights and the distance through which they fell. Like all calorimetric measurements, these results had to be corrected for a number of inherent errors. In 1878 ROWLAND made an elaborate series of experiments at the Johns Hopkins University in which he performed Joule's experiment with greatly improved apparatus. Some years later, after the thermometers had been recalibrated to conform to modern standards of thermometry, his results were corrected. Rowland's work stands with Joule's as the most important of the direct determinations. More recent investigators have relied almost invariably upon one of the indirect methods which are capable of great accuracy. W. W. S.

MECHANICAL HANDLING. *See* MATERIALS HANDLING.

MECHANICAL POWER TRANSMISSION. *See* POWER TRANSMISSION, MECHANICAL.

MECHANICS, the science concerning the conditions of rest or of motion of the objects about us. An outline of the subject follows:

- Mechanics
  - 1. Kinematics, or pure motion.
    - Translatory motion
      - Continuous
      - Vibratory
    - Rotary motion
      - Continuous
      - Vibratory
  - 2. Dynamics, or force and motion.
    - Statics—solids; Hydrostatics—liquids; Aerostatics—gases → Forces in equilibrium
    - Kinetics—solids; Hydrokinetics—liquids; Aerokinetics—gases → Unbalanced forces

The first main division has to do merely with the motion which is occurring and not with any agents which may be producing those motions. *Kinematics,* or pure motion, is discussed under the articles, VIBRATORY MOTION and VELOCITY.

Dynamics involves kinematics but deals with the FORCES producing the various motions. If the forces are in equilibrium, no motion occurs and the problem is one of *statics. Kinetics* is a study of unbalanced forces in which motion occurs. What has been said regarding forces in translatory motion holds also for TORQUES in rotatory motion.

A spring balance, when elongated by a load, comes to a position of equilibrium between the elastic forces of the spring and the attraction of the earth for the load on the spring. Similarly, an analytic balance is an equilibrium between torques. Both are problems in statics. The attraction of the earth for any body causes it to fall with linear ACCELERATION. If a mass is held by a cord wound around a drum which is free to rotate, the torque action of the weight will cause he drum to rotate with angularly accelerated motion. Both of these problems are kinetic problems.

The study in which principles of mechanics are applied to problems of machinery and structures in a practical way, is spoken of as *applied mechanics.* The principles of the LEVER and of the INCLINED PLANE are principles of mechanics. A study of these principles as they are applied in the construction of all kinds of machines constitutes a field of applied mechanics known as the "theory of machines," while a study of structures and the relations one part bears to another comprises a field known as the "theory of structures." These two fields compose the practical side of mechanics.

The abstract science of mechanics is the theoretical considerations of the problems studied under applied mechanics. The practical projects of mechanics may be subjected to mathematical analysis before they are actually carried out experimentally. Such a study lies in the field of *analytical mechanics.* S. R. W.

MECHANICSBURG, a borough in Cumberland Co., in southeastern Pennsylvania. It is situated 8 mi. southwest of Harrisburg and served by the Pennsylvania Railroad. Mechanicsburg is surrounded by good farming country, and has various manufactures, including hubs and spokes for wheels, iron fencing, silk and clothing. It is the seat of Irving College for girls. The Confederate Army reached Mechanicsburg, the northernmost point of their invasion during the Civil War. Gettysburg Battlefield is about 30 mi. to the southwest. The borough was founded about 1806 and incorporated in 1828. Pop. 1920, 4,688; 1930, 5,647.

MECHANIC'S LIENS, claims filed for work done or materials furnished in constructing a building or improving it. In England lands were charged by agreements with the owner who usually gave a mortgage. In the U.S., mechanic's lien laws are provided for by the statutes, varying in detail in different states. These liens take precedence over all other claims against the property. They are not claims against any other property of the owner, nor, in most states, against him. These claims are filed within a fixed time after the completion of the work unless there is a contract for the payment of amounts on certain partly completed work. Liens take precedence in the order of their filing. In some states sub-contractors who have not dealt directly with the owner are allowed to file mechanic's liens. *See also* BUILDER'S LIEN.

MECHANICVILLE, a city in Saratoga Co., eastern New York, situated on the Hudson River and the state barge canal, 20 mi. north of Albany; it is served by river craft, bus lines and two railroads. The region has large grain and potato crops; the city has lumber, paper and knitting mills and other manufacturing establishments. The Battle of Saratoga, Oct. 7, 1777, was fought 6 mi. from Mechanicville. The first settlers came about 1680. Mechanicville was chartered by the county court in 1857 and became a city in 1915. Pop. 1920, 8,166; 1930, 7,924.

MECKLENBURG DECLARATION OF INDEPENDENCE, a series of resolutions, first published in the Raleigh (N.C.) *Register,* Apr. 30, 1819, apparently adopted by a convention of delegates of the militia companies of Mecklenburg County, N.C., at Charlotte, May 20, 1775. These resolutions declare "the allegiance of the citizens of Mecklenburg County to the British Crown . . . absolved and all political connections with that nation broken off," and otherwise closely resemble the DECLARATION OF INDEPENDENCE, which they apparently anticipated by more than 13 months. However, their authenticity is highly dubious.

MECKLENBURG-SCHWERIN, a free state in northern Germany with Schwerin as the capital. It is bounded by the Baltic Sea, Pomerania, Mecklenburg-Strelitz, Brandenburg, Hanover, Schleswig-Holstein and Ratzburg. In 1925, the state had 674,045 inhabitants, 93.8% of whom were Protestant; the dialect is Low German (Plattdeutsch). The most important cities besides Schwerin are Rostock and Wismar. Agriculture is the chief occupation, cattle raising being also important. The state has little industry and commerce. It is governed by an executive body of three, elected by the Landtag of 50 members.

MECKLENBURG-STRELITZ, a free state in northern Germany consisting of two parts, the larger, in the east, surrounding Neustrelitz, the capital, and bounded by Mecklenburg-Schwerin, Pomerania and Brandenburg; the smaller, Ratzeburg in the west, bounded by Mecklenburg-Schwerin, Lübeck and Schleswig-Holstein. In 1925, the state had 110,269 inhabitants and is the most thinly populated part of Germany; 94.3% of the people are Protestant. Their dialect is Low German (Plattdeutsch). The area is 1,131 sq. mi. The most important city beside Neustrelitz is Neubrandenburg. There are many schools, but the University of Rostock in Mecklenburg-Schwerin suffices for both states. The majority of the populace are engaged in agriculture, cattle raising being important. There is little industry or commerce. The state is governed by an executive body of two men elected by the Landtag of 35 members. The language and customs of the people, particularly the peasants, indicate that they are of Slavonic origin.

MECOPTERA, the name for an order of soft-bodied insects, which have two pairs of membranous wings and biting mouths. All are probably carnivorous. The most familiar family is that of the scorpion-flies, *Panorpidæ.* Their name is due to the fact that the males carry the posterior end of their bodies curved up, like scorpions. The larvæ resemble caterpillars, and live in the ground.

MEDALS, small pieces of metal, often coin-shaped, decorated with a design which is usually a portrait, a scene commemorating some event or an inscription. Larger medals are called medallions and are sometimes in the form of a tablet or panel. The first imprinting on metal is thought to have been done about the 4th century, B.C. As civilization advanced, the first medals or coins were devised as a medium of exchange. From this early beginning has developed the art of the medalist, an art closely related to sculpture.

The principles of the two early methods of making medals still prevail. These are the die method, which involves stamping the design on the metal with a die; and the cast method, in which the medal is formed by casting molten metal in a mold. Medals of gold, silver, copper or brass were used by the early Romans and Greeks as prizes in athletic games and in commemoration of great events. In Greece the medalist's art, particularly that of Evaenetos, attained a high degree of excellence.

The art of the medalist from these early times sank into oblivion. It was revived by Vittore Pisano, commonly known as PISANELLO, a painter of Verona, who gained a great reputation as a medalist from 1439 to 1449. He was particularly successful in the portraiture of men and women on cast medals, and his work gave rise to a great demand for portraits and allegories in medallions. The art spread from Italy to Germany and France. Nations adopted medals and medallions as a means of perpetuating great historical events. Every important happening in French history since this time is so commemorated. England made a similar use of medals, though to a lesser degree. The English battle medals are Britain's most outstanding series.

The first medals in America were presented for achievement in battle. Washington received a gold medal when the British evacuated Boston in 1776 and subsequently Congress has awarded many medals for valor. The premier decoration in the United States is the Medal of Honor, instituted in 1862 for recognition of signal service in the Civil War.

The cast medal declined in popularity in the 18th century, and the die medal took its place. Chased medals also were produced. In these the design was traced on a thin sheet of metal with various tools and punches. The importance of the art was marked in Austria by the opening of a school for medalists in 1768. A similar school was established in Paris in 1803 as a part of the *École des Beaux Arts.*

The modern revival of the medallic art began in France early in the 19th century. Active in this movement were the French medalists David d'Angers, Oudine and Ponscarme, the latter the master of the famous trio, and Chaplain, Roty and Charpentier. The monotonous academic tradition which had prevailed up to this time was uprooted. Chaplain's work, excellent in characterization of the subject, striking in its bold simplicity, glorified heroic figuration. Roty's medals, full of a lyric beauty, combined poetry and truth in his allegories and symbols. Charpentier, a stern realist, introduced originality of composition by disregarding any use of the allegorical and substituting figures from life and nature in its stead.

In the Vienna school Boehm, Scharff, Pawlik and Marschall were outstanding. The medals and medallions of Scharff, the pupil of Boehm, show an exquisite delicacy of technique and composition typically Viennese. Pawlik's medals and plaques are similar in workmanship to those of Scharff. Marschall's excellent portraits and compositions, executed in the modern decorative spirit, won him the highest place in Viennese art. In the latter part of the 19th century, interesting examples of the medallic art were produced in Belgium, Germany, Spain, Switzerland and England. In the latter country the productions of Frank Bowcher and, later, of Alphonse Legros were outstanding.

At the Paris Exposition in 1900 the United States was strikingly represented in the medalistic art. The medals and medallions of Saint-Gaudens, John Flanagan and Victor David Brenner are notable for their portraiture and beauty of design. The exploitation of modern machinery and the resultant mass production of medals caused a setback in artistic medal design and subsequent developments have been unimportant. The German and Italian medals of modern date are the most significant. A number of these are carved by hand directly from bronze. Among the many medals issued during the World War, few of which were outstanding, the work of the German Ludwig Gies ranks high.

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MEDALS AND BADGES. *See* DECORATIONS.

MEDEA, in Greek mythology, daughter of Aeetes, king of Colchis, and a famous sorceress, who helped Jason obtain the Golden Fleece. Escaping with him in the Argo, she strewed the sea with the fragments of the body of her slain brother, so that her father, stopping to collect them, might not catch the fugitives Medea lived with Jason at Corinth until he deserted her for Glauce. The sorceress murdered the bride, as well as her own children, and fled to Athens where she married Aegeus and bore to him Medas, the ancestor of the Medes. She finally returned to her father and helped him to regain his throne, of which he had been robbed.

MÉDECIN MALGRÉ LUI, LE ("The Physician in Spite of Himself"), a farcical comedy by MOLIÈRE, based on an old *fabliau.* The action is taken up chiefly with the mad antics and ruses of Sganarelle and Léandre, the "apothecary." Lucinde, the daughter of the wealthy Geronte, and Léandre's sweetheart, has feigned dumbness in order to escape marriage with her father's choice, Horace, but is cured completely, after many tricks and preposterous situations, by Léandre, the physician in spite of himself. The play was produced in 1666 and set to music by Gounod, 1858.

MEDELLÍN, a city of Colombia, capital of the state of Antioquia, situated at an elevation of 4,824 ft., about 150 mi. northwest of Bogotá. The central and western ranges of the Cordilleras lie on either side. Medellín is connected with Puerto Berrio, on the Magdalena River, and with Marinilla and Rio Negro; it is also connected with the Cauca River. It is the terminus of several automobile roads, one of which, when completed, will connect the city with the port of Nicoclí on the Gulf of Uraba. It has a healthful climate, and is one of the most attractive places in the republic, with a library, a university and other schools, a mint and a museum. Medellín

exports hides, coffee and metals. It is considered the second city of Colombia. Pop. 1928, 120,044.

MEDFIELD, a town and village in Norfolk Co., eastern Massachusetts. The village is near the Charles River, 18 mi. southwest of Boston and is served by the New Haven Railroad and by bus lines. Straw hats have been manufactured here since 1801. The town was settled and incorporated in 1651. The village was burned by the Indians during King Philip's war. Medfield is the seat of the Medfield State Hospital and the birthplace of Hannah Adams, the author. Pop. 1920, 3,595; 1930, 4,066.

MEDFORD, a city of eastern Massachusetts in Middlesex county; a residential suburb 5 miles northwest of Boston. It is on the Mystic River and is served by the Boston & Maine Railroad. The principal manufactures are rubber goods, paper, wood and wax products. The value of its manufactures in 1929 was $9,979,215; the retail trade totaled $12,406,857. Tufts College is located here. Medford was founded in 1630 and incorporated as a city in 1892. Pop. 1920, 39,038; 1930, 59,714.

MEDFORD, a city in southwestern Oregon, the county seat of Jackson Co., situated 312 mi. south of Portland. Airplanes, bus and truck lines and the Southern Pacific Railroad afford transportation. There are untouched tracts of timber, also gold and copper, in this region. Dairy products, livestock, truck and fruit are the leading agricultural interests. Lumber and planing mills, fruit packing houses and canneries make up the principal industrial activities. In 1929 the manufactures reached approximately $1,000,000; the retail trade amounted to $10,102,276. Medford, the gateway of Crater Lake National Park, was founded in 1872; incorporated as a city in 1905. Pop. 1920, 5,756; 1930, 11,007.

MEDIA, an ancient country of Asia, lying north of Persia. In the 6th century B.C. it became one of the most important divisions of the Persian Empire, later passing to ALEXANDER THE GREAT.

MEDIA, a borough and the county seat of Delaware Co., southeastern Pennsylvania. It is situated 8 mi. southwest of the Philadelphia city line; served by the Pennsylvania Railroad and an airport. Media, formerly called Providence, was founded by Quakers, who bought the land from WILLIAM PENN and settled early in 1682 before Penn himself arrived from England. In 1850 Media was chartered as a borough. It is a residential town and still maintains a certain atmosphere uniquely Quaker. The Delaware County Institute of Science, established in 1833, has a fine scientific library. Pop. 1920, 4,109; 1930, 5,372.

MEDIASTINUM, the portion of the thoracic cavity enclosed between the right and left lungs. It contains a number of very important structures such as heart, aorta and its primary branches to head and upper extremity, innominate veins, pulmonary arteries and veins, trachea and bronchi, esophagus, and vagus nerves. The part above the heart is referred to as the superior mediastinal cavity and that including it as the inferior mediastinal cavity.

Infections to contiguous structures may spread to the mediastinum, or it may result from perforation into it, either from outside or through the esophagus. Such a condition is very likely to be fatal. TUMORS of the mediastinum may arise there primarily or be carried there as secondary metastases from malignant growths elsewhere.

MEDIATION, a common method of settling a dispute by recourse to the good offices of a friendly power. Process of mediation was expressly provided by the Convention for the Pacific Settlement of International Disputes of 1899, and was extended by the Convention of 1907. It is used generally to adjust ordinary differences which do not amount to or threaten war. The offer of mediation by one or more third states cannot be regarded as an unfriendly act. THEODORE ROOSEVELT mediated actively in the Russo-Japanese War.

MEDICAL EDUCATION. The first medical schools were temples and groves dedicated to the various healing gods, one of the most famous being the Temple at Cos, where Hippocrates taught in the 4th century B.C. Greek medical knowledge passed on to the Arabians, and by them to the European schools of the Middle Ages. Chief of these was the great school at Salerno. With the rise of the universities, medical learning also increased, and in the 16th century, clinical instruction in hospitals began. Various schools arose during the 17th and 18th centuries. By 1858 Great Britain established a General Council of Medical Education which regulated courses, terms, examinations and licensing, and European countries similarly standardized their medical institutions.

Medical education in the United States traces directly back to Great Britain, especially to the 18th century schools at Edinburgh. Early instruction in the United States was entirely by apprenticeship, lasting from two to seven years, and when medical schools began to spring up, they were unsystematic and superficial. The students, who vouched for their own study with some reputable practitioner, listened to innumerable general lectures but had few or no clinical periods. It was not until 1765 that a medical department was organized at the College of Philadelphia, later the University of Pennsylvania. The next was started at Kings College, now Columbia University. The New York Post-Graduate Medical School and Hospital, the oldest in the United States teaching solely post-graduate medicine, has united with Columbia. The Medical College at Harvard University was founded in 1782. X.

Standardization and Requirements in America. In 1847 the American Medical Association was organized. One of its functions was improvement of medical education. In 1903, it established the Council on Medical Education and Hospitals, which, since that time, has regularly published reports on the state of medical education in the United States. Previous to the present century, medical education was taught in all sorts of short courses, some of them purely lecture courses. To-day a good medical school re-

quires at least two or more years of work in an approved college of arts and sciences, in addition to a four year high school education. Several of the colleges in our country require three years of college work. Three medical colleges, University of Chicago, Rush Medical College, and Johns Hopkins, require a college degree before a student can study medicine.

Forty state medical licensing boards demand two years of work in a liberal arts college before the student takes up medicine before these state licensing boards will permit a man to appear for examination for a license to practice medicine.

The number of enrollments in medical schools has been limited during the last few years to the maximum number of students that could be handled; in other words, the number of people wishing a medical education is far more than can be taken care of by the available medical schools. The number is probably too great, because already the United States has more physicians in proportion to the population than any other country in the world.

The cost of a medical education is approximately $1,200 a year. The student should plan an outlay of at least $1,000 a year, or from $5,000 to $7,500 for the five year course. During the hospital interne year, the student's expenses for board, room and laundry are invariably paid, and in many instances internes also secure a nominal salary.

In preparation for the study of medicine, the student must have a four year high school course and at least two years of work in a college of arts. The two year premedical course must include in general chemistry, physics, biology, English composition and literature and some other non-science subjects. In addition, the pupil should learn to read and to write at least one foreign language, and have courses in botany, psychology, advanced mathematics, and if possible some economics, history and sociology.

A list of colleges of arts and sciences approved by the Council on Medical Education and Hospitals of the American Medical Association includes the names of 608 institutions, of which 81 are junior colleges. There are now in the United States, 76 medical colleges approved by the American Medical Association, and there are ten institutions in Canada.

Thirteen medical colleges have adopted the requirement of a fifth year to be spent by the student as an interne in an approved hospital, or in other clinical work before the M.D. degree is granted. There were in the United States in 1931 approximately 21,982 medical students. There were 990 women students, who constitute 4 per cent of the total number of medical students. There are 504 negro medical students. There are approximately 34 American students studying in Great Britain; 277 in Canada; 113 in Austria; 67 in Germany; 78 in Italy, and 65 in Switzerland. M. F.

MEDICAL ETHICS. From the earliest times the special nature of the relationship of the physicians to each other and to their patients made necessary the development of customs and later of their codification determining these relationships. Such was the code of Hammurabi which was based upon the principle of "An eye for an eye and a tooth for a tooth." Thereafter various codes were developed by various peoples. The Hindu code and the oath and law of HIPPOCRATES (*see also* HIPPOCRATES, OATH OF) were transcriptions of this character. Frederick the Great of Prussia outlined a system of principles governing the work of physicians.

In 1803 Thomas Percival, of Manchester, England, after consultation with many eminent men of his time, drew up a system of medical ethics for the guidance of his sons, which later became the principles of ethics for the infirmary at Manchester. This series of principles was adopted by the physicians of New York and Maryland when they organized as state medical societies. In 1847, at the time of organization of the American Medical Association, Isaac Hayes, of Philadelphia, was asked to draw up the principles of ethics for the American Medical Association. This was adopted in 1848. The principles of ethics now official in the American Medical Association are a gradual evolution of a series worked over and developed through many years. They emphasize first of all the duties of the physician to his patient. These duties include service as an ideal, patience and delicacy as highly desirable qualifications, and full assumption of responsibility once a case has been undertaken. The principles of ethics emphasize that a physician may choose whom he will serve, but that he must respond to any request for assistance in emergencies or whenever temperate public opinion expects the service.

The ethical physician does not prescribe or dispense secret medicines or other secret remedial agents. Section One says that in serious illness, especially in doubtful or difficult conditions, the physician should request consultation. "In every consultation, the benefit to be derived by the patient is of first importance." Concerning the relation of the physician to the cultists, the principles say: "A physician should not base his practice on an exclusive dogma or sectarian system, for sects are implacable despots; to accept their thraldom is to take away all liberty from one's action and thought."

The principles of ethics recognize the duty of the physician to the public. He is asked to remember that he is a citizen and to aid in enforcing laws and in giving advice concerning public health. During epidemics, physicians help the sick without regard to the risk of their own health or lives, and without relation to financial return. The physician must warn the public against false pretensions made by charlatans.

A physician who is a Fellow of the American Medical Association must subscribe to the principles of ethics. He must be a member of his county and state society as well. Each of these groups maintains a committee which hears charges of violation of the principles of ethics. The final court of appeal is the Judicial Council of the American Medical Association. M. F.



PAINTED FOR THE NATIONAL ENCYCLOPEDIA BY MARY I. EATON

MEDICINAL PLANTS

1. Jimson-Weed or Thorn Apple (*Datura Stramonium*).
2. Wild or Creeping Thyme (*Thymus Serpyllum*).
3. Wintergreen or Checkerberry (*Gaultheria procumbens*).
4. Deadly Nightshade (*Atropa Belladonna*).

MEDICAL LEGISLATION AND MEDICAL JURISPRUDENCE. Medical jurisprudence usually includes toxicology and the PUBLIC HEALTH. These subjects are separately considered. *Medical jurisprudence* is the correlation of medical knowledge to the purpose of the law. Because of its intimate relationships to human health and life, it has become necessary to control the practice of medicine by legal stipulations. Because medical information is frequently necessary in determining the extent of a disability or the cause of death, it has become necessary to provide for medical evidence in legal cases. His special knowledge enables the physician to be of help in preventing crime and in protecting the innocent from unfounded criminal charges.

In the United States, the practice of medicine is regulated by medical practice acts in each state (*medical legislation*). Medical practice is considered to be a part of the police power of the individual state. Most states have established boards of medical examiners, who, by written, oral and practical examinations, determine whether or not a physician is properly equipped to practice medicine in the particular state concerned.

The practices of members of various medical cults are controlled in some states by special boards, in some states by cultist members on the same board, and in some states forbidden entirely. Several states now have basic science acts which demand a minimum standard of education of all who propose to heal the sick, regardless of the method of healing used.

Physicians are called to testify before courts, both as ordinary witnesses and as expert witnesses. As ordinary witnesses, their testimony is based entirely upon what they have themselves observed. They offer no deductions. A physician may, in some instances, refuse to answer certain questions involving confidential matters between himself and the patient under the rule of privileged communications. An expert witness testifies either as to facts gained by himself through special examinations, or as to deductions or conclusions drawn from the facts. Expert witnesses are essentially judicial advisers of the court.

Certain forms of legal procedure demand special medical knowledge. These include coroner's assistance to dying patients in certain cases in the making of wills, the making out of reports concerning contagious diseases, birth and death certificates and special reports on the prescribing of narcotics and alcoholic preparations.

Medical jurisprudence includes also the question of malpractice. Malpractice has been defined as the failure on the part of the physician or surgeon to exercise the care, skill and judgment which the law requires and which the patient is led to expect from the physician. The physician is expected to possess reasonable skill and to exercise due care, diligence and judgment in the use of his skill. He is not expected to be a specialist, but if he holds himself out as a specialist he may be judged by the practice of similar specialists.

Criminal malpractice includes conduct so unusual and so utterly lacking in ordinary prudence and judgment that great harm or even death results to the patient. Such acts may be either wilful on the part of the physician or acts forbidden by express laws. Of the latter type are criminal abortion and the attempt to treat a patient or to operate when the physician happens to be intoxicated.

Physicians are frequently called to give evidence in questions of identification of the living and the dead; to determine the cause of death, particularly sudden or unusual; to give evidence as to wounds and injuries in relationship to crimes; to advise concerning blood stains, questions of birth, inheritance, legitimacy, paternity and affiliation. They are also asked to give advice in cases of rape and unnatural sex offences, and to assist the courts in determining the presence of mental disorder, including mental defect and insanity.

Special relationships of the medical profession to the law are now under the WORKMEN'S COMPENSATION ACTS, which vary in different states. M. F.

MEDICAL ORGANIZATIONS. Medical societies are organized in order to permit their members by association to exchange knowledge and to advance the science with which they are concerned. The first medical societies were organized in the United States in Boston in 1735, in New York City in 1749, in Philadelphia in 1765, in New York City again about 1769. The American Medical Society was organized in Philadelphia in 1773. Other medical societies were organized in New Jersey in 1766, in Massachusetts in 1781, in South Carolina in 1789, in Delaware in 1789, in New Hampshire in 1791, in Connecticut in 1792, and in Maryland in 1798.

The societies of New Jersey, of Massachusetts, and the College of Physicians in Philadelphia early began to issue records and transactions.

The American Medical Association, the leading medical organization of the United States today, was organized in 1847 to promote the science and art of medicine and the betterment of public health. It is a democratic organization, acting through the House of Delegates, made up of delegates from each state in proportion to their membership, to membership in the state, the delegates to the national convention being chosen by the House of Delegates of the state societies. Members of the fifty-four constituent state and territorial medical associations are members of the American Medical Association. It has approximately 100,000 members, and publishes a weekly journal, *The Journal of the American Medical Association,* eight special journals devoted to various medical specialties, *Cumulative Index* to the medical literature of the world, and *Hygeia,* a popular health magazine.

Other important medical organizations, meeting primarily for the advancement of specialties with which they are concerned, include the American College of Physicians, established in 1915, and composed of internists of high standing; the American College of Radiology, incorporated in 1924 to create fellowship in medical men who have distinguished themselves

in radiology, and the American College of Surgeons, organized in May, 1913, to establish an association of surgeons for advancing the science of surgery, to establish standards of hospital construction, administration and equipment, and to aid in the general advancement of surgery as a science. Membership is limited to those who have the qualifications as specialists in surgery and surgical branches, and who, after submitting case records, submit themselves to an examination. The periodical of this association is *Surgery, Gynecology and Obstetrics.*

There are also special organizations in each of the medical specialties, including the American Dermatological Association, the American Congress of Physical Therapy, the American Ophthalmological Association, the American Gastro-Enterological Association, the American Gynecological Association, the American Heart Association, the American Laryngological Association, the American Laryngological, Rhinological and Otological Society, Inc., the American Neurological Association, the American Otological Society, Inc., the American Pediatric Society, the American Physical Therapy Association, the American Psychiatric Association, the American Proctological Society, the American Psychoanalytical Association, the American Psychopathological Association, the American Public Health Association, the American Radium Society, the American Roentgen Ray Society, the American Society for Clinical Investigation, the American Society for Experimental Pathology, the American Society for Pharmacologic and Experimental Therapeutics, the American Society for the Control of Cancer, Inc., the American Society of Clinical Pathologists, American Society of Tropical Medicine, American Surgical Association, American Therapeutic Society, American Urological Association, the Association for Research in Nervous and Mental Diseases, the Association for the Study of Allergy, the Association for the Study of Internal Secretions, the Association of American Medical Colleges, the Association of American Physicians, the Association of American Teachers of the Diseases of Children, the Association of Military Surgeons of the United States, the American Association for the Study of Goiter, the American Society of Oral and Plastic Surgeons, the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, the American Association of Pathologists and Bacteriologists, the American Association of Industrial Physicians and Surgeons, the American Association of Railway Surgeons, the American Association of Genitourinary Surgeons and the American Association of Anatomists. Everyone of these organizations is devoted primarily to advancing the specialty with which it is concerned.

In addition, there are several national organizations interested in cooperation between the medical profession and the public for the advancement of science and for the public health. This group includes such organizations as the American Child Health Association, the American Association to Promote the Teaching of Speech to the Deaf, American Federation of Organizations for the Hard of Hearing, the American Dietetic Association, the American Social Hygiene Association, the American Occupational Therapy Association, the National Society for the Prevention of Blindness, and the American Foundation for the Blind.

Each of the states has its own state medical Association and most of the large cities of the country have local medical associations, in addition to special medical Branches. M. F.

MEDICAL RESEARCH. The establishment of enormous funds for investigation of the problems of disease, as well as the occupation of research and academic positions by individuals disposed to and prepared for studying these problems, has induced great progress of late years in the alleviation of suffering.

Perhaps the greatest advance has been made in the study of infectious diseases. This has been a result of the discovery of the organisms causing disease and of specific drugs or immunizing substances for them. Scarlet fever has been shown to be due to a hemolytic streptococcus, and a test devised (Dick test) to determine susceptibility of patients to the disease. The Schick test determines susceptibility to diphtheria. The pneumonia organism has been classified into four types, and specific serums developed. Much general progress has been made in bacteriology and immunology of fundamental nature not classifiable under diseases.

Certain diseases have been shown to be induced by filter-passing viruses. They include multiple sclerosis, mumps, measles, the common cold.

The tropical diseases have been intensively studied and enormous progress made in their treatment. Malaria, yellow fever, and the parasitic diseases have especially benefited. The curative effect of chaulmoogra oil in leprosy has been demonstrated.

Certain diseases, beriberi, pellagra, scurvy, rickets, polyneuritis have been shown to rest on lack of certain constituents of living foodstuffs called vitamins. At least five vitamins have been distinguished.

Rheumatism constitutes a great problem, but energy is being bent toward its study and progress has been made. The investigation of functional disorders of the heart has been greatly furthered by the use of an instrument, the electrocardiograph, and their treatment has developed following use of quinidene and standardized digitalis. Extracts of liver have been found to benefit the previously refractory pernicious anemia.

Investigation of the endocrine system has been carried to a fine point and notable contributions to treatment of disease have resulted. The active principle of the thyroid gland, thyroxin, has been synthesized in the laboratory. The causes and treatment of goiter have been pretty well solved. Diabetes mellitus has been shown to be due to a deficiency of a secretion, insulin, which is now administered with excellent effects in that condition. Active extracts also of the adrenal glands have been prepared, which exercise a

salutary effect on patients of Addison's disease. Extracts of the hypophysis are used medicinally, and the role of this organ in sexual maturity and osseus development have been demonstrated. The parathyroid glands have been shown to be vital in calcium metabolism.

The surgery of the chest, uterus, and nervous system has been quite considerably developed. Operations for certain kinds of brain and spinal cord tumors now result in permanent cures, though previously a case which had been diagnosed as having a brain tumor was considered hopeless. Other branches of neurosurgery have been likewise explored.

Cancer remains the most formidable problem of medicinal research. Surgeons now know which types of cancer can be operated and which cannot. Most important has been the use of radium and X-rays in inoperable cancer. The actual cause of cancer is still unknown.

The usefulness of X-ray in diagnosis has been extended, largely as a result of the introduction of an opaque oil, lipiodol, into the cavities of the lungs, urinary passages, female generative passages, the cavities of the brain and the space surrounding the spinal cord.

Functional tests have been devised for the kidneys, pancreas, liver and stomach. The data from these procedures are useful for the practicing physician, and as tools for further research. The chemistry of the blood and urine has been minutely investigated and developed to an exact science.

These contributions have been made by the combination of results of investigation directed toward practical disease problems and toward basic problems of anatomy, physiology, bacteriology, and pathology whose immediate results may not be apparent at the time the work is done. The importance of the latter class is not to be minimized. The work has been done by workers in special research institutes, by members of university and medical college faculties, and by private practitioners. A great number of special journals is devoted to the publication of scientific papers, and many scientific societies exist for the discussion of findings. W. J. S. K.

MEDICAL SERVICE, U.S. ARMY. *See* ARMY, U.S., MEDICAL SERVICE.

MEDICAL SERVICE, U.S. NAVY. *See* NAVY, U.S., MEDICAL SERVICE.

MEDICI, LORENZO DEI (1449-92), Florentine statesman and patron of art and letters, known as "the Magnificent," was born in Florence, Jan. 1, 1449. He was the grandson of Cosimo the Elder and the son of Piero the Gouty whom, with his younger brother Giuliano, he succeeded as head of the state in 1469. Giuliano was assassinated in 1478 by the rival Pazzi family, leaving Lorenzo the sole ruler of Florence. Art and literature flourished under his munificent patronage. Printing presses and academies for classical studies were established and all parts of the known world were searched for choice books, art treasures and antiquities to adorn Florence. The immorality and luxurious living which also flourished, combined with Lorenzo's gradual assumption of complete control of the government, aroused the enmity of a group of Florentines led by Savonarola, who stood firmly for democratic government and an ascetic life and for a time seriously threatened the power of the Medici. Lorenzo was also a lyric poet of some distinction. He died in Florence Apr. 8, 1492.

MEDICINAL PLANTS. The use of plants for medicine has been practiced since the earliest times and by all races of man. The primitive ideas of medicinal value rested on superstition and accidental discovery, doubtless supplemented by the process of trial and error. These have been replaced in modern times by methods of chemical analysis and pharmacological experiment, which have eliminated numerous worthless plants from the pharmacopœia. Nevertheless, most of the medicinal plants employed to-day became known to the medical profession through their earlier use by the laity or by uncivilized peoples. There are doubtless still many valuable plants with qualities as yet completely unknown and unsuspected awaiting discovery and introduction into medical science. For centuries the supply of medicinal plants depended on the collection of wild plants, with abundant opportunity for the confusion and adulteration of drugs. More recently many species have been cultivated on a large scale, even supplanting the native products, as in the case of *Cinchona,* now extensively grown in the Dutch East Indies. Successful cultivation is generally contingent on cheap labor and has seldom been profitable in America. Hundreds of species of plants are now officially recognized in pharmacy. A few of the more important, with their native country or principal source, are enumerated here in the following table:

Plant	*Origin*	*Medicinal Name*
Aconitum Napellus	Europe	Aconite, aconitine
Aloe vera	N. E. Africa	Aloes
Atropa Belladonna	Europe	Atropine, Belladonna
Brassica nigra	S. Europe; widely cult.	Mustard
Cassia, several species	N. Africa, S. Asia	Senna
Cephælis Ipecacuanha	Brazil	Ipecac
Cinchona, several species	Andean Region	Quinine, Peruvian bark
Cinnamomum Camphora	E. Asia	Camphor
Claviceps purpurea	Europe	Ergot
Coffea arabica	N. E. Africa; Brazil	Caffein
Digitalis purpurea	Europe; widely cult.	Digitalis
Ephedra, various species	China	Ephedrine
Erythroxylon coca	Andean Region	Cocaine
Gentiana lutea	Europe	Gentian
Glycyrrhiza glabra	S. E. Europe	Licorice
Hydrastis canadensis	E. United States	Golden Seal, Hydrastis
Papaver somniferum	W. Asia; widely cult.	Opium, morphine
Plantago Psyllium	S. Asia	Psyllium seed
Rhamnus Purshiana	N.W. United States	Cascara
Rheum officinale	China	Rhubarb
Ricinus communis	S. Asia; widely cult.	Castor Oil

Plant	*Origin*	*Medicinal Name*
Smilax, various species	Tropical America	Sarsaparilla
Strychnos Nux-vomica	S. E. Asia	Nux vomica, strychnine
Urginea maritima	S. Europe	Squills
Zingiber officinale	Trop. Asia; widely cult.	Ginger

H. A. G.

MEDICINAL SPRINGS. The practice of treating chronic disorders, like gout, by medicated baths, or "taking the waters" at certain mineral springs is an ancient one in many parts of the world. Josephus records the visits of Herod to the warm baths of Calirrhoe, near the Dead Sea. Pliny mentions medicinal springs all over Europe. The Indians discovered the therapeutic properties of springs at Saratoga, N.Y.

For centuries the beneficial effect of famous baths, like those at Bath, Nauheim, Baden-Baden, Carlsbad, Aix-la-Chapelle, and Lucca, was imputed to their chemical content—alkaline, saline, or acid, and (in the case of thermal springs) to their temperature.

The discovery in 1903 that mineral springs arising from great depths (among them some but slightly mineralized) are more or less radio-active, has led to the ascription of their therapeutic value in part to radium emanations. Medicinal springs are now rated by their radio-activity, measured in "Mache units," as well as by chemical analysis. Thermal springs are usually more active than cold. Regions of recent volcanic action appear to favor radio-activity, although in Japan, which is rich in such springs, they gush from granite.

Of American springs the most notable for radium emanations are those at Hot Springs, Va., Manitou Springs, and many others in Colorado show activity, as do the springs at French Lick.

Among beneficial results attributed to treatment at radio-active springs is "rejuvenation" in the scientific sense, a curious commentary on the fabled Fountain of Youth.

MEDICINE, HISTORY OF. In the earliest times, the healing art went along with magic and religion and was occupied mainly with treatment. Then the Greeks obliterated the magic element and organized temples of healing. Their greatest physician, Hippocrates, called "The Father of Medicine," created rational diagnosis and separated practice from priestcraft. The center of medical progress and teaching moved from Egypt to Greece, then back to Egypt, through Alexander the Great, where we find it next at Alexandria, with Herophilus and Erasistratus as the best known physicians; then in Rome, where Galen reasoned so plausibly that medical science stood still for a thousand years, helped out in this stagnation, of course, by the exclusive theological outlook of the Dark Ages. Thought was concentrated on the next world and astrology and theology became modes of life insurance.

In the ninth and tenth centuries, Rhazes and Avicenna were the chief exponents of medicine under the Moslems. Servile acceptance of dogma was the rule, until Paracelsus (1493-1541) defied the authorities which had been followed so blindly and introduced the use of chemicals in the treatment of disease. Vesalius (1514-1564) and his successors developed anatomy, Ambroise Pare (1510-1590) advanced surgery, the past achievement of which is summarized in Celsus, Paul of Ægina and Albucasis. William Harvey demonstrated the circulation of the blood (1616) as found in his treatise *De Motu Cordis* (1628).

Important anatomical and physiological discoveries then followed. Sydenham (1624-1689) initiated a return to the study of the patient in disease (Hippocrates) and of epidemics. In the succeeding centuries, great teachers of clinical medicine flourished. Morgagni (1682-1771) demonstrated the relation of symptoms to pathological changes in the body, Sylvius and Boerhaave (1668-1738) taught at the bedside in Leyden and Haller (1708-1777) made his mark in physiology. Baglivi and Lancisi in Italy urged the study of disease at the bedside. John Hunter (1728-1793) made surgery an experimental science, Edward Jenner (1749-1823) demonstrated the prevention of smallpox by vaccination, which was to be the starting point for practical work in immunizing the body against disease.

Auenbrugger (1722-1809) introduced percussion and Laennec (1781-1826) auscultation and the stethoscope in the diagnosis of diseases of the chest. The discovery of Schleiden (1838) and Schwann (1839), that the living organism is a community of individual cells led to epoch-making studies of the finer structure of human tissues by Henle and His, of tissues in diseases by Virchow (1850). Pasteur (1822-1895) developed bacteriology and preventive inoculation, found means of preventing rabies and anthrax, as also the diseases of the grapevine and silkworm. Koch (1843-1910), by improved culture methods, discovered the tubercle and cholera bacilli and demonstrated the relation between bacteria and wound infections. Long and Morton introduced anesthesia by ether and Simpson by chloroform, and these innovations, along with Lister's application of antisepsis to wound treatment, permitted an unprecedented development of operative surgery.

In 1843, O. W. Holmes called attention to the contagiousness of childbed fever, which was demonstrated by Semmelweiss in 1846; this control has made childbearing much safer, apparently as a set-off to the bungling of backwoods obstetrics. Operative gynecology was developed by McDowell, Marion Sims, Battey and other surgeons of the Southern States.

Rapidly the relation of bacteria and parasites to disease was established by many workers, such as: Neisser, gonococcus; Hansen and Neisser, the lepra bacillus (1879); Eberth, typhoid (1880); Nicolaier, tetanus (1884); Weichselbaum, meningococcus (1887); Klebs (1883), Loeffler (1884), diphtheria; Shiga, dysentery (1897); Schaudinn, syphilis (1905); and McCoy and Chapin tularemia (1911).

Notable improvements in methods of diagnosis have revolutionized medical practice, e.g., Garcia, laryngo-

scope (1855); Helmholtz, ophthalmoscope (1851); the Roentgen rays (1895) and the application of many of the newer methods of science, such as the electrocardiograph in heart disease, exact chemical determinations in diseases of nutrition.

In tuberculosis, the use of fresh air, sunlight, diet, home instruction by nurses, sanitarium treatment and proper methods of preventing contagion has diminished the disease 50%, aided by such special diagnostic procedures as the skin test of Pirquet (1907) and the Roentgen ray.

Sanitation has worked miracles. Sewage disposal, clean streets, pure water, pure milk and the destruction of flies, mosquitoes and other insects have lengthened and enhanced the value of life. Nearly all infectious diseases have been wiped out or controlled.

The control of insect carriers of disease has yielded unbelievable harvests. The mosquito was suggested as a transmitter of yellow fever by Finlay and demonstrated by Reed, Carroll, Lazear, and Agramont. Malaria carried by the mosquito, plague by fleas or rodents, typhus fever by flies, typhus fever by lice, Rocky Mountain fever by ticks are other examples.

The use of antitoxins is another notable achievement; examples are diphtheria (von Behring, 1889), tetanus, snake venom, erysipelas, etc. Serum from human convalescents is used in treating, controlling or modifying infantile paralysis, measles, scarlatina and other infections. Vaccines have been extensively used in the prevention of disease; typhoid vaccine, discovered in 1888 by Chantemesse and Widal, has made the disease preventable; whooping cough, boils, and other affections are now managed by this method.

Lind (1750) described the prevention of scurvy by fresh fruit juices; while the study of nutrition by exact methods, as suggested by Rubner, Voit, Atwater and Benedict, and the discovery of vitamins by Hopkins, Funk and others, have led to better treatment or prevention in scurvy, rickets, pellagra, beriberi, certain eye diseases and some infections.

Many new methods of treatment have been discovered, such as the use of liver in pernicious anemia; salvarsan and other chemicals in syphilis; insulin in diabetes; the use of malaria infection in paresis; thyroid extract in such deficiency diseases as myxedema and cretinism, and the use of iodine to prevent goiter.

Advances have been made recently in the relation of mind and disease, and new ideas introduced by Janet, Freud and Jung.

The greatest advances in the nineteenth century were anesthesia, asepsis in surgery and sanitation. The twentieth century opened with the fuller development of the various fields of medicine and surgery; a better understanding of immunity; rational organotherapy; countless advances in the technique of diagnosis and treatment; and the beginning of the prevention of disease, of periodical examinations and instruction, not only in the case of infections, but in many other diseases. J. R.

MEDICINE BALL, a leather covered ball, stuffed with soft materials, weighing from four to nine pounds, used in athletic training. Generally a group of three or more persons stand in a circle and throw the ball to one another with a forearm thrust. The exercise tends to develop the arm and shoulder muscles, and for this reason has found favor with boxers. Several games have been designed for the medicine ball, in one of which players on opposing sides of a court throw the ball over a high net. The name is a corruption of the Indian medicine bag, a hide container holding charms guaranteed to keep the wearer healthy.

MEDICINE HAT, a city and a judicial seat of Alberta, Canada, situated at an altitude of 2,144 ft. on the South Saskatchewan River, about 200 mi. southeast of Calgary. Medicine Hat markets the wheat and garden produce of the surrounding area. Manufacturers are attracted by the natural gas supply. There are extensive greenhouses, flour mills, candy and linseed oil factories, potteries and machine shops. The city has many churches and educational foundations, over 5,600 acres of parks and an airport. Founded in 1883 by the Canadian Pacific Railway, in 1900 it was incorporated. Pop. 1921, 9,634; 1931, 10,310.

MEDICINE MAN, a name used for a SHAMAN among the American Indians and the savage aborigines of Australia and Africa. The medicine man is supposedly possessed of extraordinary powers which he gets by direct transmission from some supernatural source and which enable him to foretell the future, heal the sick and perform other miraculous acts. Trance, contortions, trembling and raving are the stock in trade of the medicine man who usually has certain specialties such as endurance of fire and boiling water and feats of jugglery with which to impress his public.



FROM GEORGE CATLIN'S "NORTH AMERICAN INDIANS"

A BLACKFOOT MEDICINE MAN

MEDICK, a name given to various leguminous plants closely allied to the clovers. Among the best known is the black medick or nonesuch (*Medicago lupulina*), a low clover-like annual with bright yellow flowers and black spirally twisted pods. It grows in

pastures and waste places throughout Europe and much of Russian Asia and is a very common naturalized weed in North America. Alfalfa, closely allied to the foregoing, is sometimes called purple medick.

MEDIEVAL DRAMA. The beginnings of modern drama are to be traced not to classical times but to the Middle Ages. The works of Æschylus, Sophocles and Euripides were lost to western Europe for a thousand years and drama was never one of the great types of Roman literature. In the time of Cicero the theater at Rome was already straining after the spectacular and showing other signs of decadence, and in the later centuries of the Empire with the disturbed political situation and the restlessness of the populace it could scarcely compete with the gladiatorial combats and the races of the arena and the amphitheater. Even the broad farces of the mimes maintained themselves with difficulty. The church opposed them on various grounds—their vanity, their paganism, their frequent ridicule of the new religion, and their indecency—and the barbarians were not interested in drama. Only a faint dramatic tradition may have passed down from classical times to the Middle Ages through the hands of the MINSTRELS. Europe was without drama for 500 years. When the type once more appeared it sprang from new seed.

The germ of this new development is to be found in the church service. About the year 800 certain chants sung by the choir were amplified by the addition of phrases or sometimes whole sentences woven into the original text. Such amplifications are called tropes. Some are in dialogue form, suitable for antiphonal singing by the two halves of the choir. Such, for example, is a trope of the *Introit* or opening chant of the Easter Mass, *Resurrexi et adhuc tecum sum*. The words of this trope are the beginning of modern drama:

Quem quaeritis in sepulchro, o Christicolae?
Iesum Nazarenum crucifixum, o caelicolae.
Non est hic; surrexit sicut praedixerat.

Whom seek ye in the sepulchre, O dwellers in Christ?
Jesus of Nazareth, the crucified, O Heaven dwellers.
He is not here; he has arisen as he predicted.

This colloquy between the angels and the Maries at the tomb was in time sung by selected members of the choir, appropriately clad to impersonate the speakers, either at the altar or at a special structure called the Easter Sepulcher. A similar dialogue was sung at Christmas, closely modeled on this Easter trope, representing a conversation between the shepherds and the midwives. From these simple beginnings, by the addition of other speeches, characters and related incidents, small plays, or operas, resulted, and these in turn became the model for the similar representation of other Biblical scenes. In time these representations outgrew the church services. The liturgical bonds became weakened, the vernacular encroached upon the Latin, the musical accompaniment was dropped, touches of homely realism and even humor crept in, and the ceremony ended up by being separated entirely from the service and being transferred to the churchyard and the public square.

In western Europe the representations of Biblical episodes were formed into long vernacular cycles, the performance of which occupied a whole day and at times extended over several days. In France and Germany such cycles centered generally around the representation of the Passion. In England they embraced a number of Old Testament incidents such as the creation of the world, the expulsion of Satan, the Temptation and Fall, Cain and Abel, the Flood, Abraham and Isaac, and from these passed on to the principal events in the life of Christ, closing with a representation of the Last Judgment. Four complete cycles in England have survived in the form which they reached at the height of their development in the 15th century—those of York, Wakefield (also called the Towneley Plays), and Chester, and an unlocalized cycle which goes by the name of the *Ludus Coventriae*. Of these the York Plays show the most complete cyclical development, while the Towneley cycle is distinguished by some half dozen plays, including the celebrated second Shepherds' Play, by an unknown dramatist appropriately called in modern times "the Wakefield Genius." The composition of these cycles falls apparently in the first half of the 14th century, but in their present form they represent revisions extending over more than 150 years. In England the pageants were produced by the trade guilds, generally on movable platforms or pageant wagons which could be drawn to suitable open spaces in the city. The successive episodes were repeated before the crowds assembled at each station. On the Continent the episodes concerning the Crucifixion and Resurrection received most emphasis. A production of this type is familiar to-day in the Passion Play given every ten years at Oberammergau.

In the 15th century a new type of play known as the moral play or morality arose. (*See* MORALITIES.) In this type the characters are personified abstractions, such as Mankind, Temperance, Covetousness, and the theme is generally some aspect of man's life in its relation to the forces of good and evil that contend for the possession of his soul. *Everyman*, the finest of the English moralities, treats of the summoning of Everyman by the messengers of death. As one passes from the Middle Ages into the modern period there emerges in England a new type known as the INTERLUDE, in which the didactic purpose is abandoned, the subjects are secular, the treatment is realistic, and the object is entertainment for its own sake. The principal name among writers of the new type is that of JOHN HEYWOOD (1497-1578), whose plays differ chiefly in their brevity and the slightness of their plots from the fully developed comedy of a generation later. *See* FRENCH DRAMA. A. C. B.

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MEDIEVAL GUILDS. *See* GUILDS.

MEDINA, JOSÉ TORIBIO (1852-1930), Chilean historian, was born in Santiago de Chile, in 1852. Medina was one of the most distinguished bibliographers of the New World. He has to his credit more than 300 volumes devoted to studies in American history. Some are original contributions, although the majority are collections of documents. Medina had his own printing press on which he and his wife printed many of his works, setting the type with their own hands. Among these are *Aborijenes de Chile; Biblioteca Hispano Americana; Biblioteca Hispano-Chilena; Historia de la Literatura Colonial de Chile; Historia del tribunal del Santo oficio de la inquisición de Lima; La imprenta en Mexico; Las medallas Chilenas.* Medina died in 1930.

MEDINA, a city of Arabia situated on an oasis about 240 mi. north of Mecca. The venerated city contains the tomb of Mohammed, who fled from Mecca to this city in 622. From this flight dates the Mohammedan era. The great mosque containing the tomb is for the Mohammedan a place of meritorious pilgrimage, second only to Mecca. The city lies at an elevation of 3,000 ft. and is built of solid stone. The streets are narrow and everywhere lined with lodging houses for pilgrims. Pop. about 30,000.

MEDINA, a village in Orleans Co., western New York, situated on the State Barge Canal and Oak Orchard Creek, about 10 mi. southwest of Albion. It is served by the New York Central Railroad. Diversified farming, especially fruit growing, is carried on in the region. The local manufactures include soil pipe, metal products, canned fruits and vegetables, furniture and hardware. Medina was incorporated in 1832. Pop. 1920, 6,011; 1930, 6,071.

MEDIOLANUM, the name of some six ancient towns of Italy, the chief of which, situated in a plain between the rivers Ticina and Addua, is the modern MILAN. At first the capital of the Insubres in Gallia Transpadana, in 222 B.C. Mediolanum was taken by the Romans. In the 4th century the emperors of the west held their court here, until ATTILA took and plundered the town. Under Theodoric the Great, under whom it became the capital of the Ostrogothic Kingdom, it surpassed even Rome in size and wealth. In 539 A.D. the city was taken by the Goths and almost completely destroyed. Under the Lombards it recovered its importance.

MEDITERRANEAN SEA, a body of water of the Eastern Hemisphere, connected with the Atlantic by the Strait of Gibraltar, and with the Indian Ocean by the Suez Canal through the Red Sea. It is bounded on the west by Spain; on the north by France, Italy, the Grecian archipelago and Asia Minor; on the east by Asia Minor; and on the south by Africa. Tributary seas connected with it are the Tyrrhenian, which is almost inclosed by Corsica, Sardinia, Sicily and Italy; the Adriatic between Italy and Yugoslavia; and the Aegean between Greece and Turkey. The Aegean connects by way of the Dardanelles and Sea of Marmora with the Black Sea. Besides those islands mentioned as bordering seas, the Mediterranean contains the Balearic group, Cyprus and Malta. The great Nile of Egypt is its only large tributary river.

The Mediterranean has an estimated area of 1,000,000 sq. mi., an average depth of 4,690 ft., and a maximum depth of 14,450 ft. Its waters are warm, blue and peaceful, with very little tide to disturb them, and its shores and islands are famous for their beautiful landscapes and salubrious climate. Although the smallest ocean on the globe, it has figured most prominently in the world's history. The early civilizations of Egypt, Phoenicia and Greece developed on its shores, and the water commerce, piracy and naval warfare of the Western World originated on its waters.

MEDIUM, in the spiritualist doctrine, a person endowed to act as a conveyor of messages from the dead to the living or to perform any of the phenomena advanced in evidence of such belief, such as a trance-medium, slate-writing medium, table-turning medium and materialization medium. Psychologically the term has been extended as a convenient name for phenomena associated with a temperament, and in marked cases with a tendency to dissociation. The possession of such peculiar powers of vision, prophecy, inspiration, moving bodies without contact, reading sealed messages, and above all acting under the control of the dead and conveying their messages, is a continuous tradition from primitive man to the present.

Without commitment to any belief in any spirit or transcendent explanation, the phenomena themselves form an interesting chapter in abnormal psychology. *See* SPIRITUALISM.

MEDLAR (*Mespilus germanica*), a small tree of the rose family closely allied to the apple and hawthorn. The plant is a native of Europe and Asia Minor, widely cultivated in the Old World for its fruit. The crooked trunk, sometimes 20 ft. high, bears thorny branches with oblong, finely toothed leaves and large white flowers appearing after the foliage. The astringent apple-shaped fruit, about 2 in. in diameter, is edible only after the autumn frosts and incipient decay (bletting) have changed the character of the pulp.

MEDUSA, in classical mythology, one of the GORGONS, female monsters with snakes for hair and claw-like hands. PERSEUS, at the instigation of Polydectes, or according to other legends, at the incitement of ATHENA, beheaded Medusa. From her body PEGASUS sprang up.

MEERSCHAUM, common name for the mineral sepiolite. It is usually white but may be gray, yellowish or reddish. Sepiolite is soft, tough, with a dull appearance and a smooth feel. When dry it will float on water, whence the name, the German for sea-froth. Meerschaum is found in clay-like beds, in masses in serpentine, and sometimes fibrous or in veins. It is a hydrous silicate of magnesium. At Vallecas, Spain, beds of sepiolite provide a valuable and light building stone. In the Moorish baths in Algeria it is used as

soap. Meerschaum is also found in Asia Minor and Greece. Fine pipes are made of meerschaum.

MEERUT, a city of British India in the United Provinces, situated between the Jumna and the Ganges, 36 mi. northeast of Delhi. It is surrounded by a dilapidated wall enclosing narrow streets and badly built houses. The most important edifice is the English church, with a fine spire. A cantonment was established in 1806 and British and native troops are accommodated. It was here that the first great outbreak of mutiny among the Sepoys took place in 1857. Pop. 1921, 122,609; 1931, 136,740.

MEESTER, JOHAN DE (1860-), Dutch novelist, was born at Harderwijk, Feb. 6, 1860. He is the author of many novels and short stories, and in 1903 became editor of the *Nieuwen Gids,* or *Current Guide.* Among his best known works are *Een Huwelijk,* or *Matrimony,* 1890; *Deemoed,* or *Humility,* 1901; *Der Zonde in het Deftige Dorp,* or *Sin in the Respectable Village,* 1912; *Walmende Lampen,* or *Steaming Lamps,* 1920. Meester's works are realistic and mildly satirical.

MEFISTOFELE, an opera in four acts by ARRIGO BOÏTO, the libretto based by the composer on Goethe's *Faust;* première, Milan, March 5, 1868; first performed in the United States, Nov. 16, 1880, at Boston. The opera attempts to cover more of the action and philosophy of the Goethe epic than the music-dramas on the same theme by Gounod and Berlioz. Chaliapin made of Boïto's *Mefistofele* one of the celebrated bass rôles of opera.

MEGACYCLE, a unit of FREQUENCY consisting of one million cycles per second. It is commonly used to express radio station assignments in the short and ultra-short wave-length regions. *See also* RADIO COMMUNICATION.

MEGAERA, in Greek mythology, one of the EUMENIDES or Erinyes, goddesses of vengeance, known in Rome as Dirae. Megaera was the jealous one. The other two were Alecto and Tisiphone.

MEGALITHS, literally "great stones," the name given to monuments of massive stones, generally in their natural condition. Megalithic monuments are found in many countries, for example, in northern Africa, Spain, Portugal, Corsica and Sardinia, France, Great Britain and Ireland, Belgium, Denmark, Sweden, Norway, Germany, Russia and India. It is thought that they were originally tombs or sepulchral chambers, consisting of three or more large stones set upright, with a flat stone, or stones, laid on them, like a table top; the whole forming a chamber. Monuments of this type are called dolmens. Sometimes the top stones are immense. Other megalithic monuments are held to have been astronomical observatories, in particular intended to record the direction of the rising sun at midsummer. Of these, the gigantic stone circle at Stonehenge, on Salisbury Plain, England, is the most famous. The megalithic monuments of Carnac in Britanny, are noteworthy. *See* ARCHAEOLOGY.

MEGALOKASTRO. *See* CANDIA.

MEGALOPTERA. Some entomologists place the families of insects commonly known as alder-flies, dobsons and fish-flies, in a separate order, the *Megaloptera.* Other entomologists still retain these families in the order *Neuroptera. See* INSECTS; DOBSON FLY.

MEGGER, an electrical instrument for measuring electrical resistances, as of the earth, or of grounded connections in power, telephone, and telegraph lines. It reads directly in ohms by means of a galvanometer deflected by a current coil and a potential coil, current being furnished by a hand driven generator. It is also used in electrical methods of applied GEOPHYSICS for investigating geological formations.

MEGOHM, a unit of electrical RESISTANCE which is one million times the magnitude of the OHM.

MEIGGS, HENRY (1811-1877), an American lumberman and contractor. He was engaged in lumber shipping to California after 1849, and later went to South America where he contributed greatly to the growth of the continent. In Chile he constructed a number of bridges, and in Peru built the Arequipa to Mallando and the Arequipa to Puno railroads, and the Juliaca to Cuzco extension of the latter. He also built other lines, among them the Callao, Lima and Oroya Railroad, which is rated as one of the most difficult feats of its kind owing to the height of the Andes Mountains. The great wealth he thus accumulated, he used to beautify the city of Lima, Peru.

MEIGHEN, ARTHUR (1874-), Canadian statesman and former prime minister, was born at Anderson, Ont., June 16, 1874. He attended Toronto University, and in 1902 began law practice, gaining prominence as a pleader in the criminal courts. In 1908 he was elected to the House of Commons, and five years later became solicitor general in the Conservative government of Sir Robert Borden. He was appointed secretary of state and minister of mines in 1917, and later the same year was minister of the interior. He was author of the Military Service Act, a measure which earned him considerable Liberal hostility. In 1920, he became prime minister and secretary of state. His government was defeated the following year. In 1926 he again headed the ministry for a brief period.

MEIJI TENNO (Mutsuhito) (1852-1912), the 122nd emperor of Japan, was born Nov. 23, 1852. During his boyhood in Kyoto he had a great deal of freedom to mingle with the ordinary people of the city because at that time the actual control of Japan was in the hands of the shogun and the emperor was living in obscurity. Mutsuhito became emperor in 1867 upon the death of his father, and, as a result of the agreement of the shogun and the other military leaders, the actual as well as the nominal rule of the empire was put into his hands. This restoration marked the beginning of the modernization of Japan. Mutsuhito led that modernization process for 45 years, and the success of Japan in reconstructing her national life is due in no small part to his great ability and

statesmanship. He succeeded in securing and holding the cooperation of a notably capable group of men who were called in at the time of the restoration, and who worked with him throughout that long period. During his lifetime the foundations were laid for the political, economic and social reconstruction of the country, and a large amount of building on those foundations was done. By 1890 the preparations were completed for the establishing of parliamentary government, toward which the emperor and his associates had been working since the time of his restoration to power. In that year the first Japanese elective diet met and the system of responsible parliamentary government was introduced. Japan owes her modern position in the world much more to the Meiji Emperor than to any other one man. He died July 31, 1912.

MEIR (2nd century), famous Tanna, or teacher of the Mishna, and one of the most significant Jewish scholars of his century, was born and died in Asia Minor. His teachers were ELISHA BEN ABUYAH, Akiba and Rabbi Ishmael. He continued the dialectical method of his teacher Akiba in interpreting the Scriptures. His clear and concise legal opinions, and his arrangement and classification of Jewish laws later became one of the prime sources and bases for Judah Hanasi's redaction of the Mishna, about 220; indeed, the Mishna cites more than 300 opinions by Rabbi Meir, in the various branches of Jewish religious law, and many other anonymous decisions are ascribed to him. He attained great fame as a writer of parables and fables, and is generally called the Jewish Aesop; 300 fox-fables alone are attributed to him.

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MEIR OF ROTHENBURG (1220-93), authority on the Talmud and rabbinic law, was born at Worms, Germany, in 1220. Little is known of the later years of his life. In 1287, for reasons which are unknown, he attempted to leave Germany, perhaps in order to go to Palestine. He was apprehended by Rudolph of Habsburg, who imprisoned him at Ensisheim, Upper Alsace. Meir consistently refused to permit the Jewish communities of the country to ransom him, and died in prison in 1293. Fourteen years after his death, in 1307, his bones were redeemed by Süsskind Alexander Wimpfen, and they were buried in the cemetery at Worms. Meir's responsa, or answers to various religious and rabbinical questions directed to him by many of the Jewish communities of Germany, of which over 1,500 have been preserved, are valuable for the picture they give of the political and social conditions of the Jews of Germany in the 13th century. Other works of his included Tosafoth, or additions, to several tractates of the Talmud, and treatises on marriage customs, Jewish blessings, the laws of ritual slaughtering, and Jewish mourning customs. He gained unusual renown as a liturgical poet as well; 19 of his poems are included in the German Mahzor, or prayer-book, for the New Year's Day and the Day of Atonement. His greatest poem was a dirge on the public burning of Hebrew books at Paris in 1244. A. SH.

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MEISSEN, a Prussian city in the province of Saxony, situated on the Elbe River, near Dresden. It is rich in ancient buildings. The Gothic cathedral, built on an eminence, is an artistic edifice. The first cathedral was burned and rebuilt between 1260 and 1450. There are also other churches of interest. Next to the cathedral stands the castle, the Albrechtsburg, built in late-Gothic style and dating from 1471-85. The famous Meissen china factory, the oldest in Europe, was housed there from 1710 to 1864. This concern has a permanent exhibition, showing the evolution of the form and design of china ware from 1710 to the present time. Henry I built a fortress, and his son, Otto the Great, founded the bishopric. There are factories of diverse sorts and trade in grain, cattle, leather and wine. Pop. 1925, 45,485.

MEISSONIER, JEAN LOUIS ERNEST (1815-91), French genre and military painter, was born at Lyon, Feb. 21, 1815. He studied under Léon Cogniet in Paris. *The Visit to the Burgomaster,* dated 1831, now in the Wallace Collection, London, was his first attempt at microscopic painting, the genre in which he did some of his finest work. *The Connoisseurs,* in the Musée Condé, Chantilly, is characteristic of these miniatures in oil. It is however as the military painter that Meissonier is known to-day. His masterpiece, *1814,* in the Louvre, Paris, tells the tragic story of the Russian retreat and is probably the most notable of 19th century French historical paintings. Meissonier died at Paris, Jan. 21, 1891.

MEISTERSINGER, DIE, an opera in three acts, music and libretto by RICHARD WAGNER; première, Munich, 1868, London, 1882, New York, 1886. When he composed it in 1863 Wagner was 50 years old. He already had behind him the bulk of his life's work: *Rienzi, Der Fliegende Hollander, Tannhäuser, Lohengrin, Tristan und Isolde,* and the major part of *Der Ring des Nibelungen.* The first four operas had been produced. But he was discouraged, and the public was persistently indifferent. He was almost on the point of abandoning creative work when King Ludwig II of Bavaria came to his aid and made possible the completion of the *Ring* as well as the production of *Tristan und Isolde* and *Die Meistersinger.* Written in the height of his powers, the last work is an outburst of pure joy. It is Wagner's only comedy.

Plebeian successors to the Meistersingers, or Mastersingers, were a guild of musicians flourishing in the 14th, 15th, and 16th centuries in Germany. Nuremberg was a favorite meeting-ground for these minstrels who regularly contended for musical honors. Hans Sachs (1494-1576), a cobbler by profession but a poet by passion, was a guiding spirit among the fraternity. A contest is to be held during midsummer. Walther von Stolzing, a Franconian knight, enters it. He is in

love with Eva, daughter of Veit Pogner, a goldsmith, and has been promised her hand if he wins the contest. Unfortunately the rules of the fraternity are highly pedantic. Consequently the charm of Walther's song is entirely overlooked by the judges who maintain that he breaks all the rules of correct music. Sixtus Beckmesser, the town clerk, is also in love with Eva, and takes every opportunity to chalk down demerits against his rival. Of all the fraternity only Hans Sachs, the cobbler-poet, recognizes Walther's genuine musical eloquence. The young musician, although defeated, persuades Eva to elope with him. But Beckmesser turns up at the critical moment, serenades Eva himself, and the town is shortly in an uproar. To preserve the peace, Hans draws Walther aside, takes him home, and the following morning Walther sings a song which he dreamed the previous night. In order to trap Beckmesser, Hans passes off the song as his own. Beckmesser, unable to catch its spirit, makes a complete failure when he tries to sing it; thereupon Hans calls upon Walther to try it. Filled with the beauty of his own creation he performs it with such skill that the Meistersingers instantly recognize his genius. His song wins the prize, and he in turn wins Eva.

MEISTERSINGERS, the name given to the burgher poets of Germany who, in the 14th, 15th and 16th centuries, formed schools and guilds throughout the land, and followed in some respects the tradition of the MINNESINGERS. With their weekly meetings, their classes, stern regulations, law-books, etc., the Meistersingers were methodical, diligent and enthusiastic; their most important productions were the poems of HANS SACHS (1494-1576).

MELANCHTHON, PHILIPP (1497-1560), German theological reformer and co-worker with Martin Luther, was born Philipp Schwarzerd at Bretton, Baden, Germany, Feb. 16, 1497. Educated at Heidelberg and Tübingen, in 1518 he became professor of Greek at Wittenberg. The next year he was appointed professor of theology, laboring in this field for 42 years and gaining a following that eventually brought as many as 1500 students to his lectures. Basically a humanist (*see* HUMANISM), yet he is known as the father of evangelical theology. During Luther's absence on the Wartburg, Melanchthon acted as leader of the Reformation, taking part in the Diet of Augsburg, 1530. He drew up the first draft of the Augsburg Confession of Faith, which was later revised by Luther and others. Of a more conciliatory temper than Luther, he sought to adjust the differences with the Roman Catholics by conference and compromise. He deplored the violent tactics of Luther and was ready to accept Catholic practices if modified by evangelical doctrine. His chief literary work was *Loci Communes Rerum Theologicarum,* 1521, the first didactic treatise of Protestant theology. When the Protestant divines signed the Lutheran or Smalkaldic Articles, Melanchthon qualified his signature by saying he would accept the pope if he did not claim to rule by divine right. The last years of Melanchthon's life were taken up with theological disputes, and in various attempts to settle the differences between the Church of Rome and the Lutherans. He died at Wittenberg, Apr. 19, 1560.

MELANESIA, that division of Oceania which lies immediately northeast of Australia. It includes British New Guinea, New Britain, New Ireland, the Bismarck Archipelago, Santa Cruz, the New Hebrides, the Admiralty, Solomon, Loyalty and Fiji islands and New Caledonia. Politically these islands belong mostly to the British Empire. New Caledonia is a French colony. Their unity is based upon the homogeneous character of their inhabitants who are dark skinned and speak a different language from the lighter Micronesians and Polynesians.

MELANESIAN, a group of the MALAYO-POLYNESIAN linguistic family, spoken in New Britain, New Ireland, New Hebrides, and the Loyalty, Solomon, Banks and Fiji Islands, etc., no member of which has been reduced to writing except by Europeans. The BASE is differentiated into various classes of nouns and verbs by prefixes and suffixes. As in INDONESIAN gender is lacking, as is number, except in pronouns; case is indicated by prepositions or by simple position; and conjugation is denoted by pronouns attached to the verb-stem. The verb, which has no passive, has particles prefixed to express present, indefinite past, definite past, future, continuous action and permanent state. The pronouns are divided into isolated and suffixal, and that of the first plural has both an inclusive and an exclusive form ("we, including you," "we, but not you"). A quasi-dual and trial ("they two," "they three") are formed by combining the words for "two" and "three" with the plural of the pronoun. The system of enumeration is either decimal (derived from Indonesian) or a combination of quinary and vigesimal, e.g., "seven" = "five plus two"; "thirty" (in the Loyalty Islands) = "man" = "twenty" (= 4 x 5 fingers and toes) "plus five plus five." L. H. G.

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MELANESIAN NEGRO. *See* RACES OF MANKIND: *Negroid Group.*

MELBA, NELLIE (1861-1931), *née* Mitchell, Australian soprano singer, was born at Melbourne, May 19, 1861. She made many youthful appearances at Melbourne, and studied with MATHILDE MARCHESI at Paris. In 1887 she made her début as Gilda at Brussels. Her success was instantaneous, and she was at once engaged for London. She made her American début in 1893. Her voice was characterized by wonderful flexibility, and she almost invariably sang under her full tone. She was created Dame Nellie Melba in 1918. She died at Sydney, Australia, Feb. 23, 1931.

MELBOURNE, capital of the state of VICTORIA, the second largest city in Australia and an important port, situated on the Yarra River about 6 mi. by water from Hobson's Bay, upon which are also Port Melbourne and Williamstown with piers and anchor-

age for the largest vessels. The river has been made navigable for coastal vessels to the business center of Melbourne.

Greater Melbourne has included since 1925 all districts within a radius of 10 mi. from the center of the city. The population of this metropolitan area, about 1,018,200 in 1929, is more than 56% of the total for the entire state. It includes the extensive suburbs of Collingwood, Flemington, famous for its race-course, and Fitzroy, North Melbourne, Carlton, Brunswick, Prahran, Hawthorn, Richmond, South Yarra, Kew, St. Kilda and others.

The city has many beautiful streets and buildings. On Collins Street, the finest in Australasia, is situated the town hall. There are government buildings, two cathedrals, the university, museums, libraries, art galleries, and numerous parks and recreation centers. The chief industries are the preparation of wool, leather, wood and iron. Exports include wool, wheat, flour, fruits, dairy produce and dressed meats.

Melbourne was the seat of the Commonwealth government from 1901 to 1927. Dootigola, the native name of the township, was changed to Melbourne in 1837 in honor of the British prime minister of the day.

MELBOURNE, UNIVERSITY OF, a coeducational institution at Melbourne, Australia, founded in 1853 by act of the Victorian Legislature. It includes departments of Arts, Science, Law, Medicine, Dentistry, Veterinary Science, Engineering, Agriculture, Education, Commerce and Music. In 1923 the passage of a new University Act increased the annual endowment and provided an additional grant for university extension and research work. The Medical School ranks among the best in the British empire. Investigations are undertaken for Government hospitals and medical practitioners in the bacteriological laboratory. There are 70,000 volumes in the library. In 1930 there was a total enrollment of 3,256 students, and a faculty of 193, including lecturers and tutors, headed by Sir John H. MacFarland, Chancellor.

MELCHERS, GARI (1860-), American figure painter, was born at Detroit, Mich., Aug. 11, 1860. He studied at Düsseldorf and in Paris, and later lived in Holland to which he had been led by the picturesque quality of Dutch customs and costumes. Melchers's colorful, high-keyed paintings of Dutch peasant life are vigorous, wholesome and free of sentimentality.

MELCHIZEDEK, a Canaanitish priest-king whose story is told in the Book of Genesis. He is there described as King of Salem and priest of the most high God. He entertained Abraham and received tithes of spoils from him. Many modern scholars aver that he is "an imaginary personage," and that "he owes his idealistic existence to a scribe's error." They say that the scribe misunderstood a passage in the ancient Hebrew text having no reference to an individual. Whether this may be credited or not, one of the Psalms (10:4) uses his reputation to say, "Thou art a priest forever, after the order of Melchizedek," and the author of the Epistle to the Hebrews (5-7) discusses him as a type of Christ. In more recent years the Church of Jesus Christ of the Latter Day Saints, the Mormons, have adopted the type of priesthood associated with his name.

MELCOMBE REGIS. *See* WEYMOUTH.

MELETIUS OF ANTIOCH, ST., bishop of Sebaste, was born at Militene in Armenia of noble parents early in the 4th century. He was chosen bishop of Sebaste in Armenia, and after having been exiled by the Emperor Constantius, was recalled as bishop under Emperor Gratian. Meletius consecrated Gregory of Nazianzus bishop of Constantinople and was instrumental in the formulation of the solutions to the theological difficulties that arose during the 4th century. St. Meletius died while sitting with the Council of Constantinople about 381. His day is Feb. 12.

MELGAREJO, MARIANO (1820-72), Bolivian despot, born in Cochabamba, Apr. 15, 1820. On Dec. 28, 1864 he installed himself, through a revolution, as provisional president of Bolivia. Cruel, energetic and despotic, he did away with constitutional practices. Susceptible to honors, he yielded Bolivian territory to Brazil in return for the condecoration, "Great *Cros* of the Order of the Cross." General Melgarejo dissipated public funds and has been called by Bolivian historians a disgrace to the country. He was assassinated by a favorite general, Aurelio Sanchez, Nov. 23, 1872, in Lima.

MELILLA, Africa, on the north coast of Morocco. It is a heavily garrisoned Spanish possession, lying 135 mi. southeast of Ceuta. Situated on a stony projectory, it stretches into the Mediterranean and terminates in the Cape of Tres Forcas. The inhabitants mine and export iron ore. The Spaniards conquered the town in 1496 and have maintained it since, despite attempts made by various factions in Melilla to overthrow the Spanish government. Est. pop. 1931, 60,580.

MELIORISM, the middle position between optimism and pessimism. It does not regard this as the best of all possible worlds nor yet that it is hopelessly evil. The world contains both good and evil elements, with a possibility of eliminating much of the evil and expanding the good. In this sense the meliorist tends towards optimism; but his optimism is based on facts. He realizes the possibilities for improvement but also appreciates the difficulties. Among contemporary philosophies both pragmatism and the new realism pride themselves on a melioristic outlook.

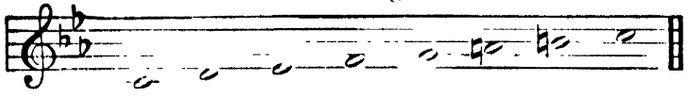
MELLON, ANDREW WILLIAM (1855-), American Secretary of the Treasury and banker, was born at Pittsburgh, Pa., Mar. 24, 1855. He was graduated at the University of Pittsburgh in 1873, and entered the bank of Thomas Mellon & Sons, later organized as the Mellon National Bank, Pittsburgh, of which he became president in 1902. During his career in banking he became interested, in part, with H. C. Frick, in coke, coal, iron, aluminum, oil, electrical and zinc properties. In 1921 he resigned from

the Mellon National Bank to enter the Harding cabinet as Secretary of the Treasury, in which office he remained under Presidents Coolidge and Hoover. He was instrumental in securing funding agreements with nations owing wartime debts to the United States. He opposed high income tax rates, both upon individuals and upon corporations, especially in the upper ranges of the surtaxes, contending that they discouraged business enterprise and as a result produced less revenue than if the rate were fixed lower. In the fall of 1931, however, faced with a tremendous deficit, he urged an upward revision of income taxes. He unsuccessfully opposed the veterans' legislation authorized by Congress in Mar., 1931, whereby they might borrow from the government up to 50% of the face value of adjusted compensation certificates. Mellon was appointed Feb. 3, 1932 by President Hoover to the post of Ambassador to Great Britain.

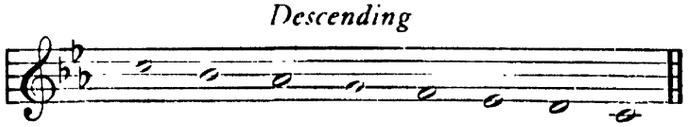
MELLON INSTITUTE OF INDUSTRIAL RESEARCH, an institute which functions primarily as an industrial research organization, established at the University of Pittsburgh in Mar., 1913, by Andrew A. Mellon and Richard B. Mellon. The research work of the institute is organized on a contract basis, the problem being set by a person, or organization interested in its solution. An industrial fellowship is assigned for a period of at least one year and the institute engages scientists to do the research, all results belonging exclusively to the donor of the fellowship. The scientific investigations of Mellon Institute are mainly in the field of chemistry and related sciences. The institute occupies a building especially designed and constructed for its work at a cost of $350,000, and a new laboratory is approximately 300 by 400 ft. with a height of 7 stories. At the present time there are 65 industrial fellowships in operation each relating to a different subject, and approximately 150 scientists and engineers are engaged in the work. During the fiscal year ending Feb. 28, 1930, a sum of $929,102 was expended in the institute in the support of research.

MELODIC MINOR SCALE, distinguished from the HARMONIC MINOR SCALE, is a modification of the latter, although it has the same signature which is that of a major scale starting a minor third higher. It has two forms, the ascending and descending, alike in using the minor third but unlike in that the ascending scale uses the major sixth and major seventh whereas the descending scale uses the minor sixth and minor seventh. The C-minor melodic scale, representing the construction of all melodic minor scales, is as follows:

Ascending



Descending



MELODRAMA, originally, a drama accompanied in some manner with music, the latter being introduced for the purpose of increasing the emotional appeal. To-day it commonly designates an inordinately romantic play, abounding in exciting incidents and situations and relying in large measure on extreme sentimentality of theme and treatment.

MELODY, a succession of tones varying in PITCH and usually in durational value. Any such series may be called a melody, but only one affording a unitary impression is commonly accorded the title. Many attempts, including those by Christoph Nichelmann in *Die Melodie,* Anton Reicha in *Traité de Mélodie,* and Hugo Riemann in *Neue Schule der Melodik,* have been made to codify the laws of melodic utterance, but it cannot be said that great success has attended them. In general, a diatonic melody is better than a chromatic melody, while some simple rhythmic pattern is generally to be preferred to one that is complex; however, even the most carefully guarded generalizations are vulnerable in this field, since the two elements forming a melody, pitch and duration, are almost always inextricably entangled with each other. Singly, each is nearly wholly devoid of significance, while the perfect admixture of them both furnishes, not a general law, but a unique model that may inspire, although it will hardly instruct, the melodic student.

MELON, the name given to the fruit of various succulent trailing vines of the gourd family, especially to the MUSKMELON (*Cucumis Melo*), and the WATERMELON (*Citrullus vulgaris*). The name melon is also applied to a mass of blubber of hemispherical shape found in the top of the head of several whale-like animals, as the black fish and grampus.

MELOS or **MILO,** a small island of ancient Greece, lying in the southwestern part of the Cyclades. It is well-known as the island on which was found the celebrated statue now in the Louvre, Paris, the VENUS OF MILO.

MELPOMENE, in classical mythology, the Muse of tragedy. *See* MUSES.

MELROSE, a city of Middlesex county, eastern Massachusetts, 7 miles north of Boston of which it is a residential suburb. It is served by the Boston & Maine Railroad. The principal manufactures are shoes, dress materials, jewelry and machine supplies. The total manufacturing production for 1929 was $2,108,575; retail business amounted to $6,402,407. Melrose was founded in 1629 and incorporated in 1850. Pop. 1920, 18,204; 1930, 23,170.

MELROSE ABBEY, undoubtedly the finest ruin in Scotland, at Melrose, Roxburghshire. Of this former Cistercian house founded in 1150 by Hugh de Morville, twice destroyed and rebuilt in the 14th-15th centuries, the most interesting building now standing is the Choir, dating from about 1450. Near the site of the high altar of this Gothic building, the heart of ROBERT BRUCE is said to be buried. Melrose Abbey, the "Kennaquhair" of Sir Walter Scott's *Monastery,* was presented to the nation in 1918 by

the Duke of Buccleuch. Scott's estate, ABBOTSFORD, is 3 mi. to the west.

MELROSE PARK, a suburban residential village in Cook Co., Ill., 11 mi. west of Chicago and connected with that city by the Chicago and Northwestern Railroad, and by electric and motor bus lines. Although predominantly a residential community for Chicago business men, Melrose Park has several industries; the principal ones are can factories, iron works, railroad shops and stone quarries. In 1929 the retail trade amounted to $3,858,864. Pop. 1920, 7,147; 1930, 10,741.

MELUKITZ, a North American Indian group speaking a dialect of the Kusan linguistic stock. They lived on Coose Bay, Ore.

MELVILLE, GEORGE WALLACE (1841-1912), American naval officer, engineer and explorer, born in New York City, Jan. 10, 1841. He studied at the Brooklyn Polytechnic Institute and in 1861 became third assistant engineer in the Navy. During the Civil War he was commended for his part in the action against C.S.S. *Florida.* He took part in several Arctic rescue and exploration trips, his experiences being recorded in his *In the Lena Delta.* His last Arctic voyage was in the *Thetis* sent to find Greely in 1884. In 1887 he became chief of the Bureau of Steam Engineering of the Navy. Melville retired with the rank of Rear Admiral in 1903. He died Mar. 17, 1912.

MELVILLE, HERMAN (1819-91), American author, was born in New York City, Aug. 1, 1819. In his early 20's he shipped on a whaler bound for the Pacific, but after more than a year's service under a hated captain, he deserted, only to fall into the hands of cannibals. Melville was unharmed, however, and eventually found his way back to New York. Here he occupied a position in the New York Customs House; but his chief interest was in writing. His most famous book is *Moby Dick,* 1851, universally regarded as a great piece of sea literature and increasingly regarded as one of the great classics of American literature. He had previously published *Typee* and *Omoo,* both dealing with South Sea life. Melville's other books are of slighter consequence. He died in New York City, Sept. 28, 1891.

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MEMBRANES, SEMI-PERMEABLE, a term applied to those membranes separating a solvent from its own solutions, if they permit diffusion of the solvent but do not allow the dissolved substance to pass through from solution on the one side to pure solvent on the other. As applied to dialysis of colloid suspensions in liquids, these membranes are selected so that substances in true solution pass through, while the larger colloid particles do not. This technique is used in recognition of colloid suspensions (often perfectly clear to the eye) and in the separation of solute molecules and ions from the colloid suspension (*see* COLLOIDS AND THE COLLOIDAL STATE).

Some of the membranes commonly used in dialysis are parchment paper, bladder, goldbeaters' skins, collodion, cellulose acetate, and viscose films (cellophane). All these are suitable when water is the solvent, but of course, other membranes may be required for some of the non-aqueous solvents. It is essential that the solvent dissolve in the membrane, but that the membrane should not dissolve or disintegrate in the solvent.

Semi-permeable membranes used to show osmotic pressure are not all of the type in which the solvent truly dissolves. They may be merely porous films with pores so small that they strongly adsorb (*see* ADSORPTION) (and are filled with) the pure solvent. In such a case the solvent diffuses through, but the solute may not. In some instances substances in true solution fail to diffuse through, as in the use of a copper ferrocyanide membrane separating sugar solution from water. *See also* OSMOSIS. H. N. H.

MEMEL, a territory and town with a population of 145,000 and an area of 943 sq. mi., on the Baltic at the mouth of the River Nieman. By the PEACE OF VERSAILLES, the territory was surrendered by Germany to the Conference of Ambassadors, and handed over by them to Lithuania on Feb. 16, 1923, on condition that port privileges be extended to Poland.

MEMORY, the function of recall. It has been crudely thought of as the storehouse for experience. In memory one may relive the happenings of his past. The memory image is not quite so vivid as the perceptual, but at times is nevertheless very vivid. Perhaps intense might be a better way of differentiating between the two.

The retention property of the nerve cells is the neurological basis for memory. Whenever an impulse passes over the neurones it modifies them to some extent. Nervous energy will travel over this pathway just that much easier the next time such a stimulus is presented. This is the foundation of habit, which is also due to the retention property of the nerve structure. Obviously habit is a form of memory, and in fact sometimes is called biological memory. In its broad sense memory includes the whole retention function; in its narrower meaning it has reference to the recall of ideas or images which have previously passed through consciousness.

The order in which ideas are recalled has been accounted for by the laws of association. Ideas are associated with one another by contiguity, by similarity, and by contrast. (*See* ASSOCIATION OF IDEAS.) There are also other factors of recall, such as primacy, recency, frequency, intensity and novelty. First impressions are lasting; it is the original association that counts. This is a common observation of experience. Other things being equal, which they usually are not, events of recent date will be more apt to be recalled than those which happened long ago. It is interesting to note, however, that in cases of senility the memory often begins to fail for recent happenings first, while the events of childhood may still stand out in bold relief. Perhaps this is due to the factors of primacy and intensity, which have created a special inter-

est in the one set of events that is lacking in the other. The factor of frequency has already been illustrated in habit formation. Intensity as a factor in recall has just been referred to in the above illustration. The more intense the stimulus, the greater is the impression it is apt to make, and hence the easier it is to be recalled. The novel thing attracts attention and is more apt to be remembered than the commonplace.

The secret of a good memory is a clear first impression. A realization and comprehension of connections and relations between things is more potent in effecting their later recall than mechanical repetition. Memory is selective. The ability to forget is as essential as a clear and accurate memory. R. N. B.

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MEMPHIS, a city of ancient Egypt, situated on the left bank of the Nile, about 10 mi. from the Pyramids. After the decline of THEBES in the 12th century B.C., Memphis became the capital and principal city of Egypt. But with the Arab conquest in the 7th century A.D. it greatly decreased in importance. To-day only a few scattered monuments remain of the city's former magnificence.

MEMPHIS, the largest city of Tennessee, the county seat of Shelby Co., and the most important commercial center on the Mississippi River between St. Louis and New Orleans, situated in the southwestern corner of the state, about 200 mi. southwest of Nashville. It is a railroad center, with nine trunk lines and numerous branch lines. Additional transportation is afforded by three public barge lines, river steamers, motor buses and trucks. Facilities for transportation by water and rail are coordinated by two finely equipped municipal terminals.

The city lies on the Chickasaw bluffs, well above the flood stage of the river. Two railway bridges, one of which also carries vehicular traffic, cross the Mississippi River at this point. The city has an extensive system of public parks, which is well integrated with its highways. It is the seat of the colleges of medicine and dentistry and the schools of nursing and pharmacy of the University of Tennessee and of Southwestern University.

Its advantageous location and transportation facilities make Memphis a natural industrial and distributing center. It is an important hardwood lumber and cotton market. Deposits of sand, gravel, bauxite, brick and clay are located in the vicinity. In 1929 its manufactures, which had a total value of approximately $161,000,000, included food products and preparations, lumber products, cottonseed-oil and chemicals. The 367 wholesaling organizations distributed $316,300,363 worth of merchandise with cotton, farm supplies and lumber the principal items. The 3,190 retail stores, which did an aggregate business of $154,639,862, gave full-time employment to 15,527 people. Memphis is the seat of a branch of the Federal Reserve Bank.

According to tradition, DE SOTO first saw the Mississippi in 1541 while standing on the site of Memphis. The town was laid out in 1819 and incorporated in 1826. The city was in the hands of Federal troops during most of the Civil War. A commission form of government was adopted in 1910. Pop. 1920, 162,351; 1930, 253,143.

MENA, a city in western Arkansas, the county seat of Polk Co. It is situated 85 mi. west of Hot Springs and is served by U.S. highways 71 and 270, by state highways 8 and 88, and by the Kansas City Southern Railroad. Mena is a trade center in a diversified farming region; the chief local industry is lumber. The city is on a high plateau surrounded by the beautiful Ouachita Mountains. It was founded in 1896. Pop. 1920, 3,441; 1930, 3,118.

MENADO, a city of the Dutch East Indies, capital of the presidency of Menado, in the northeast part of CELEBES Island. Built on the River Tondono Menado has a fort and an ethnographical museum. It is the point of export for the region's production of coffee and rice. Pop. of Menado, 1931, about 20,000; of the residency, 900,000.

MENAI, a narrow channel of the Irish Sea, separating the island of Anglesey from Carnarvon. The strait is about 11 mi. long and at no point wider than 2 mi. It is noted for the suspension and tubular bridges which cross it. Navigation is difficult on the channel.

MENANDER (c. 343-c. 291 B.C.), Greek writer of comedy, was born at Athens about 343 B.C. The author of over 100 plays, he was the most famous of the writers of the New Comedy, although in contests with his rivals he was successful only eight times. His reputation for clever comedy, based on rather simple plots, rests mainly on adaptations by PLAUTUS and TERENCE, for of his own work only brief fragments written on papyrus remain. Many of these have been brought to light in the present century. The New Comedy dealt with everyday life, and Menander's aim was to give a true picture of life as he knew it in the Athens of his day. He resided there always, and died by drowning in the Bay of Phalerum, east of the Piræus.

MENASHA, a city in Winnebago Co., eastern Wisconsin, situated on Lake Winnebago where it flows into the Government canal of the Fox River, 5 mi. south of Appleton. Lake and river craft and three railroads afford transportation. The Menasha Airport is adapted to the needs of surrounding cities. Menasha has the same industrial and social interests as Neenah, a city across the river. The city has various manufactures, and is also an important publishing and printing center. Menasha was founded in 1848; chartered as a city in 1874. Pop. 1920, 7,214; 1930, 9,062.

MENCIUS (Mang Tsze) (372-288 B.C.), Confucian philosopher, was born 372 B.C. in Lû, the birthplace also of Confucius (now the province of Shantung). He was a pupil of Tsze Ssu, the grandson of Confucius. His father died when Mencius was a child and the family was poor. Mencius taught that

human nature is good. He maintained that there are four principles of goodness, benevolence, righteousness, propriety and wisdom, which are innate. Every man at birth possesses the potentialities of a sage. Taking individual worth as the fundamental quality, he holds that equality is the central principle in social life. All men are by nature good and need only self-realization to be made perfect. Applying this equalitarian theory to politics, he advocated democracy and contended that the people of the state are of greater importance than the sovereign. Mencius was a socialist, desiring a public land system with a certain acreage for each family and compulsory education by the government. One of the most vigorous and independent Chinese thinkers, Mencius had a sharp, beautiful and straight literary style, and is honored by the Chinese as the only perfect sage after Confucius.

MENCKEN, HENRY LOUIS (1880-), American critic, was born in Baltimore, Sept. 12, 1880. He was educated at Baltimore Polytechnic and worked consecutively on the Baltimore *Morning Herald, Evening Herald* and *Sun*. From 1914 to 1923 he was co-editor of *The Smart Set* with George Jean Nathan. In 1924, on the foundation of *The American Mercury,* he was co-editor with the same partner, but the following year, on the retirement of Nathan, he became sole editor. Mencken is widely known for his biting opinions and his vivid style. Many of his writings are collected in the volumes of *Prejudices,* which have appeared at irregular intervals since 1919. His *American Language,* 1918, is a noteworthy study of the American idiom.

MENDEL, JOHANN GREGOR (1822-84), Austrian botanist and monk, was born at Heinzendorf, Austrian Silesia, July 22, 1822. He became a priest, taught at Brünn where he later became abbot of the Augustin monastery. Mendel devoted himself to studies of plant breeding, particularly using the pea, in an attempt to determine the mechanics of heredity and hybridization. The basic principles of Mendel's law, as it came later to be known, appeared in 1865 in his *Research upon Hybridization* but it was not until 1900 that the scientific world took notice of Mendel's work. His researches revealed certain unit characteristics in plants and animals, such as color of eyes, some dominant, some recessive, each appearing in successive inbred generations according to definite numerical ratios. Mendel died at Brünn, Jan. 6, 1884. *See also* HYBRIDISM; MENDELISM.

MENDELEYEFF, DMITRI IVANOVITCH (1834-1907), Russian chemist, was born at Tobolsk, Siberia, Feb. 7, 1834. In 1856 he taught at St. Petersburg and from 1859 to 1861 he studied at Heidelberg, returning to St. Petersburg as Professor at the Polytechnique school in 1863 and at the University in 1866. He worked chiefly upon physical chemistry, and although his chemical theory of the ether and his theory that solutions are always chemical compounds were not generally accepted, his statement of the periodicity of the elements has become an integral part of modern chemistry. *See* PERIODIC SYSTEM OF CHEMICAL ELEMENTS. He died at St. Petersburg, Feb. 2, 1907.

MENDELISM, the theory of heredity which has developed out of the experiments of the Austrian monk, JOHANN GREGOR MENDEL. For about 34 years his work lay unrecognized until the revival of experimental breeding in 1900.

The essence of Mendelism is, first, the principle of segregation and, second, of dominance. Segregation is shown in the reappearance of the two grandparental characters, when two heterozygous individuals breed together. Thus if the father's father belonged to brown-eyed stock and the father's mother to blue-eyed and if the mother was similarly of mixed origin, then some of the children would show brown eyes and others blue eyes, though both the parents have brown eyes. If the parents are heterozygous in respect to two or three characters, there will be a corresponding complexity in the combinations of traits in the offspring. For example, if both parents be heterozygous in respect to eye color, to curliness of hair, and to excitable temperament, then among the children will be those with blue eyes and straight hair, those with brown eyes and curly hair, and each of these may have excitable or placid temperaments. A striking illustration of segregation is seen in the offspring of two mulattoes some of whom have pure black skin color, while other children may have skin color as white as that of the ordinary European.

The second principle, of dominance, is illustrated where two parents are strikingly different in some trait, especially where one parent has a positive trait which the other lacks. Then the presence of the trait brought in from the germ cells of one side of the house will show in the offspring, while the absence of the trait from the other side will not appear. The trait that shows is known as the dominant trait. The one which is hidden from view somatically is called the recessive trait. The dominant and the recessive traits are segregated in the germ cells of the dominant offspring, so that the recessive traits may make their appearance in subsequent generations, if two germ cells, each with the recessive trait, should combine. On the other hand, if one of the parents should furnish a germ cell with a dominant trait, the dominant trait will reappear in the offspring.

A combination of segregation and dominance yields results that can be illustrated again by eye color. Brown eye is dominant over blue, so that all of the children of a pure brown-eyed parent of pure stock and a blue-eyed parent will have brown eyes, following the principle of dominance. Such persons are, however, in respect to their germ cells heterozygous, and when they form germ cells half of them carry the gene for the dominant character and half the gene for the recessive character.

Suppose two heterozygous brown-eyed parents have offspring. Then four types of unions of germ cells are equally apt to occur, that is, an egg with a dominant gene may be fertilized by a sperm with a dominant gene; an egg with a dominant gene fertilized by

a sperm with a recessive gene; an egg with a recessive gene fertilized by a sperm with a dominant gene, and an egg with a recessive gene fertilized by a sperm with a recessive gene. Of these four combinations the first three will have a dominant gene and will show the dominant trait somatically. The other will carry only recessive genes and will show somatically the recessive form of the trait. This is the three to one ratio in the offspring of two heterozygotes that is associated with Mendelism. The foregoing simple formula is frequently replaced by a much more complicated one. Thus if a trait depends upon two positive factors, A and B, which in corresponding recessive conditions are a and b, then the heterozygote has the composition AaBb. Such heterozygous individuals form germ cells of the 4 types AB, Ab, aB, ab. If four similar types of germ cells are formed by the other mate, there are 4 x 4, or 16 combinations possible. Only one of these 16 is without a dominant gene and so only one of 16 is somatically of the recessive type. One of the 16 has two dominant genes and the other 14 have at least one dominant gene. This condition is illustrated in negro-white crosses in which the full blooded negro carries genes A and B for skin color, whereas the white has the genes a, b. In every 16 children resulting from the matings of 2 mulattoes, one will be white, one will have the full black coloration, and the others will be quadroons, one color gene; mulattoes, two color genes; or sambos, three color genes.

The complications in heredity go even beyond those mentioned in the last paragraph, since three or more genes may be responsible for a given somatic trait. Still a further complication depends upon the presence of the sex (or X) chromosome, which in humans is double (XX) in the cells of the female, but single (XY) in the cells of the male. The consequence is that, after the separation of the chromosome pairs before fertilization, the eggs are all alike in containing one X-chromosome, whereas the sperm are of two types, those containing the X-chromosome and those without it (Y). A gene that is located in the sex chromosome has, accordingly, a special type of inheritance. If it is a dominant gene, carried in duplex fashion by the mother, then all of the offspring will show this dominant trait. If, however, it is carried only by the father, then none of his sons will show the trait, because they receive only the Y-chromosome from the father and this, by hypothesis, does not carry the dominant gene, or indeed any genes at all. Color-blindness belongs in the category of such sex-linked characters. It is, however, a recessive trait. If it shows in the father, it is because his X-chromosome carries the corresponding recessive gene. Married to a normal woman, such a father will transmit the recessive gene to his daughters who, receiving a corresponding dominant gene, allelomorph, from the mother will be able to distinguish red and green. However, since half of their X-chromosomes carry the defect, half of their sons will show the defect somatically. On the other hand, since the father transmits only the Y-chromosome to his sons, none of the sons will get the father's recessive, sex-linked gene and consequently none of them will be color-blind. Since they get their X-chromosome from the non-affected mother, their offspring, in turn, will be without the defect until, in a later generation, an affected gene may be brought in through a female consort. This method of inheritance gives rise to so-called "criss cross" inheritance. *See also* HYBRIDISM. C. B. D.

MENDELSSOHN, MOSES (1729-86), called also Moses Dessau, after his birthplace, renowned Jewish author, translator of the Bible, philosopher and religious reformer, and emancipator of the Jews of Germany, was born at Dessau, Germany, in 1729, and died at Berlin in 1786. He was an intimate personal friend of Gotthold Ephraim Lessing, who immortalized him as the principal character in his famous drama on religious toleration, *Nathan der Weise.*

Despite the fact that his father was a poor scribe who wrote copies of the scrolls of the Law for his living, and despite his own physical deformity, being hunchbacked, Mendelssohn became a great leader in German Jewry, and played an important rôle in freeing his people from the shackles of the ghetto. He endeavored to reconcile Judaism with modern culture, and was instrumental in pointing out to the Jews of Germany the way to live in their modern environment. For this reason Mendelssohn translated the Bible into German, the first Jew ever to do so. Originally intended only for his children, this translation, printed in Hebrew characters, helped in introducing the Jews to a knowledge of the German language, and in awakening in them a desire to know modern life and literature.

One of Mendelssohn's greatest works was his *Jerusalem,* 1783, in which he declared that Jews were entitled to the same rights and privileges as other peoples and religions, and that the state had no right to restrict freedom of conscience and of religious belief. This doctrine later became the guiding principle in the establishing of the French and the American republics. Mendelssohn's chief philosophical work was the *Phädon,* based on Plato's dialogue by the same name, and containing a discussion of the question of the immortality of the soul. He asserted that the soul is indestructible. Because of this work his contemporaries called him the German Plato. A. SH.

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MENDELSSOHN - BARTHOLDY, JAKOB LUDWIG FELIX (1809-47), German-Jewish composer, was born at Hamburg, Feb. 3, 1809. His father was Abraham Mendelssohn-Bartholdy, who assumed the compound patronym upon his conversion to Christianity, and his grandfather was Moses Mendelssohn, the philosopher. As a youth he studied the pianoforte with his mother, Leah Salomon, working afterward under Berger, Hennings, Zelter, and Moscheles. His precocity was such that he played in public at the

age of nine, composed fluently at the age of 11, and created the overture to *A Midsummer Night's Dream* at the age of 17; his genius, therefore, had little need of formal guidance. At the age of 20 he directed Bach's *St. Matthew Passion,* which had been wantonly neglected, and ever afterward was an active propagandist for Bach's music. For two years, in 1830-32, he toured Europe extensively, in 1833 settling temporarily in Düsseldorf, where he conducted the Lower Rhine Festival and became general-director of that city's musical activities. Two years later he was appointed director of the famous Gewandhaus concerts in Leipzig, and in 1837, during one of his ten visits to England, he conducted the Birmingham Festival. The same year he married Cecile Charlotte Sophie Jeanrenaud, who bore him three sons and two daughters. In 1842 the Leipzig Conservatory, which he had aided in organizing, was opened; and there, as frequently as his duties permitted, he served as a member of the faculty. In 1847 his sister Fanny, whom he idolized, died; and this shock, shattering his nervous system, proved a fatal blow to a constitution that already had been undermined by excessive labor.

Few composers have suffered both such lavish praise and hostile criticism as Mendelssohn, and only the passage of years has permitted the musical world to view him, in sober perspective, as the composer of one of the world's major choral masterpieces—*Elijah*—and of other works, choral and instrumental, which range from sublimity to triviality. Facility was perhaps his chief handicap and his worst enemy; the very dexterity of his technique, in short, released his emotions so quickly that they often passed off into music under minimum pressure. Nevertheless, his music as a whole bears the imprint of the hand of a genuine master, and among the romantic composers of Germany he occupies a secure position. A complete catalogue of his compositions is not feasible, but mention of his chief works herewith follows: three symphonies, the concert overtures *The Fair Melusine, Hebrides, Ruy Blas,* and the *Calm Sea and Prosperous Voyage,* and incidental music to *A Midsummer Night's Dream,* a violin concerto, seven string quartets, the pianoforte sonatas *Variations sérieuses* and *Songs Without Words,* six organ sonatas, twenty-one male quartets and twenty-eight quartets for mixed voices, two oratorios, *St. Paul* and *Elijah* and *The Hymn of Praise, Christus,* and *The First Walpurgisnacht.* The latter, his *magnum opus,* was first performed in 1846 at Birmingham, England, under his baton. He died at Leipzig, Nov. 4, 1847.

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MENDOZA, ANTONIO DE (1490-1552), Spanish diplomat and administrator, and first viceroy to New Spain, born near Granada, of a distinguished and noble family, his father having been captain-general of the Spanish forces besieging Granada. After holding a number of high offices in Spain, Mendoza was appointed viceroy of New Spain in 1528, and took office in 1535. His career in the New World was marked by an energetic, active and honest administration. In spite of obstruction at home and in New Spain, insurrection by the Indians and negroes and trouble with his subordinates, he administered affairs vigorously, and during his term of office opened schools, engaged in road building and public works, established a fiscal system, encouraged agriculture and industry, introduced the printing press, and made many other innovations which set the tone of Spanish administration in the New World. The exploration and conquest of Mexico and the Southwest of the United States was pushed and Coronado's expedition into southwestern United States, Cabrillo's along the Pacific coast as far north as California, and Villalobos's to the Philippine Islands were results of Mendoza's activity. In 1551 he was transferred to Peru as Viceroy, but died the next year before he could institute reforms as he had been successful in doing in Mexico.

MENDOZA, DIEGO HURBADO DE. *See* HURBADO DE MENDOZA, DIEGO.

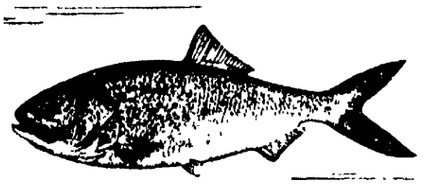
MENDOZA, a city of Argentina, situated in the western part, in the foothills of the Andes Mountains. The main streets are traversed by canals coming from the Mendoza River. The city is of commercial importance because of its situation on the Transandean railroad into Chile. The products of the surrounding district are vegetables and fruit, especially grapes and raisins, and the chief export is wine. It was founded in the middle of the 16th century by Capt. Pedro de Castillo, and was destroyed by an earthquake in 1861. Est. pop. 1930, 76,780.

MENELAUS, in Greek mythology, son of Atreus and brother of AGAMEMNON, was king of Lacedaemon and husband of Helen (*see* HELEN OF TROY), whom Trojan PARIS carried off. Menelaus led the expedition against Troy for her recovery. On the return voyage they were shipwrecked and wandered for eight years, but finally reached Sparta where they lived happily for many more years. Menelaus was the father of Hermione and Megapenthes.

MENGER, KARL (1840-1921), Austrian economist and jurist, was born at Neu Sandez, Galicia, Feb. 23, 1840. He was professor of political economy at the University of Vienna and appointed tutor to the Crown Prince Rudolf. Entering politics in 1900, Menger became "member for life" of the Austrian House of Lords. He came into prominence as the founder of the so-called Austrian school of economics. Important among his many writings is *Grundsätze der Volkswirtschaftslehre.* He died at Vienna, Feb. 26, 1921.

MENHADEN (*Brevoortia tyrannus*), also called mossbunker and bony-fish, is a small fish of the herring family (*Clupeidae*). Schools of a million or more are found swimming near the surface along the western Atlantic coast south to Brazil. Enormous numbers are caught each year by fishing companies, though the supply varies. They are not esteemed as food, but some are salted and the young are some-

times canned in sardine style. They are rich in oil, useful for many purposes, and were once used extensively as fertilizer. Their chief value is as bait for other fish, such as mackerel, bluefish, and tunnies, which prey on them in large numbers in the open sea. Menhaden have compressed, elliptical bodies from 12 to 18 in. long. They feed on water animals and vegetable matter, picked up while swimming and



MENHADEN

sifted through their long gill rakers. A single menhaden has been known to deposit more than 130,000

In 1929 the total commercial catch of menhaden in United States waters, taken chiefly on the south Atlantic and Gulf coasts, amounted to 393,405,000 lbs., valued at $2,148,000.

MÉNIÈRE'S DISEASE, a disease affecting the labyrinth of the inner ear. It may be due to bleeding into this part of the ear, or to inflammation. It occurs most often in individuals past middle age.

Ménière's disease includes the simultaneous presence of these symptoms: ringing in the ears, dizziness, nausea and progressive deafness. This symptom-complex may arise as the result of a variety of conditions.

The treatment for Ménière's disease is unsatisfactory. Bromides and iodides may help to relieve the symptoms. Operations on the semi-circular canals in the ears have been suggested.

MENINGITIS, inflammation of the membranes lining the brain and spinal cord. There are various forms of meningitis, such as cerebrospinal, tuberculous, septic and pneumococcus. It may occur rarely in various acute infections and commonly after influenza. Syphilitic meningitis also occurs.

Meningitis of the septic type often follows middle ear disease. The symptoms consist of severe headache and frequent vomiting. The temperature is high, the pulse is slow and irregular and the breathing is also slow. It is often found that the pupils of the eyes are unequal in size. Constipation is also present. Rigidity of the neck is present when the spinal cord is involved. Later on, there may be restlessness, the pulse becomes rapid and feeble, unconsciousness follows, and death results usually in a few days.

In the pneumococcus type of meningitis, the symptoms are about the same as those in the septic type. This disorder, as well as tuberculous meningitis, seems to be invariably fatal.

The symptoms seen in cerebrospinal meningitis are also similar. In addition, a skin rash may appear on the first or second day and in 25 to 50% of the cases, small blisters, known as herpes, appear about the mouth. Diagnosis of meningitis can further be made by examination of the spinal fluid withdrawn by lumbar puncture.

A serum has been prepared for treatment of cerebrospinal meningitis. With efficient serum treatment, the mortality should not exceed 30 per cent. Without the serum, the mortality is 50 to 70 per cent.

W. I. F.

MENISCUS LENS. *See* LENSES.

MENNONITES, a Christian sect which directly traces its origin to the teachings of Menno Simons (1496-1559), but also believes it has an earlier origin in the religious communities of medieval and early Christian days, which, under various names, made an organized protest against ecclesiastical rule and rigid liturgy, and attempted to worship in the simple faith of the apostolic age. In Holland, where the sect was first known about 1550, the usual word for Mennonite is *Doopsgezinde.* After introducing the weaving industry in England at the invitation of Henry VIII, they came to America early in the 17th century, and with the help of William Penn and the English Society of Friends, founded the first Mennonite colony at Germantown, Pa., in 1683. The sect soon scattered widely into Lancaster, Bucks, Berks and Montgomery counties of that state. Since the 17th century several divisions have occurred, forming the smaller branches, the largest of which are known as the General Conference of Mennonites, Old Order Amish Mennonites, Mennonite Brethren Church, and Mennonite Brethren in Christ. Of recent years a closer union has developed among all branches. The Mennonite Church, the largest body, is most numerous in Pennsylvania, Ohio, Indiana, Illinois and Virginia, in the order mentioned. Most of the Mennonites accept the "Declaration of Chief Articles of our Common Christian Faith" adopted at Dort, Holland, in 1632, which follows in substance the commonly accepted doctrines of evangelical Protestant churches. With them "the washing of the saints' feet" is an ordinance to be perpetually observed like baptism.

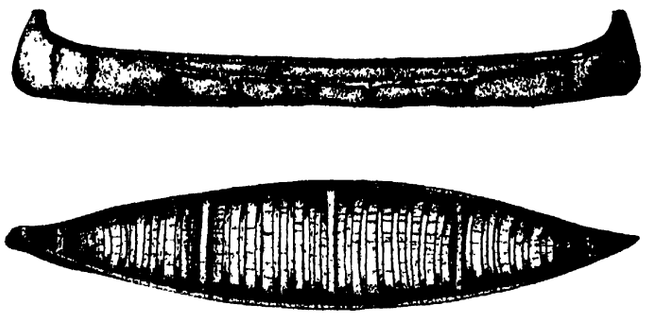
The Mennonites also believe in non-resistance, rejection of oaths, abstinence from civil offices and non-support of the state in war. The polity of their churches is generally congregational, and their ministers are usually self-supporting, sharing the farming life of the community. The Amish Mennonite movement grew out of the missionary activities of Jacob Amen, of Amenthal, Switzerland, who in the middle of the 17th century, disturbed by the laxity in discipline in the Mennonite churches, labored for a more rigorous doctrine and practice; but to-day the Mennonite Church and the Amish Movement work closely together in Conferences.

MENOMINEE, a city of Menominee Co., Mich., in the Upper Peninsula, situated at the mouth of the Menominee River, on Green Bay, opposite Marinette, Wis., with which it is connected by three bridges. It is served by three railroads and lake steamers, and by car ferry across Lake Michigan to Frankfort. Menominee has a large baby carriage factory, planing

mills, and is an important lumber-shipping port. The retail trade amounted to $5,103,684 in 1929. The Michigan Military Academy is located here. Menominee was settled in 1834 and incorporated in 1883. Pop. 1920, 8,907; 1930, 10,320.

MENOMINEE RIVER, a river of Michigan, formed by the junction of several small streams in Iron Co. in the northern peninsula. It flows south to the state line where it receives the Brule River and continues southeastward, forming the boundary line between Wisconsin and Michigan until it empties into Green Bay. The cities of Menominee, Mich., and Marinette, Wis., are situated at its mouth. The area drained by this river is a section rich in copper and iron deposits and is densely forested.

MENOMINI, a North American Indian tribe speaking a language of the Algonkian linguistic stock, dialectically related to Sauk Fox and Kickapoo of the same family. When first encountered by whites the Menomini were living near the Menominee River in the Green Bay region of Wisconsin. They subsisted largely on the wild rice which they gathered. Both dugout and birch bark canoes were used. Their



COURTESY AMER MUS OF NATL HISTORY

BIRCH BARK CANOE USED BY THE MENOMINI INDIANS

winter dwellings were round lodges covered with bark or bullrushes. In summer they lived in square bark houses. A system of picture writing on wooden slabs and strips of birch bark had been developed. They had great belief in sacred bundles, or packs, of charms which were regarded as particularly important in connection with war and hunting. The Medicine lodge and *midewin* or dream dance were their great ceremonies. They now live on a reservation in Shawano and Oconto counties, Wis. About one-half adhere to the old life and religion, the others having adopted Christianity. The Menomini are fairly prosperous, deriving an income from the cutting and selling of timber on the reservation.

See A. Skinner, *Amer. Mus. Nat. Hist. Anthro. Papers,* vol. 13; C. Clark, *The American Indian,* 1917.

MENOMONIE, a city in western Wisconsin, the county seat of Dunn Co., situated on the Red Cedar River, 62 mi. east of St. Paul, Minn. Two railroads serve the city, which is a trade market and shipping center for the farm crops and lumber of the vicinity. Menomonie has various manufactures. James Huff Stout came here in 1889, made a great fortune in lumber and endowed several local institutions. Stout Institute was taken over by the State and has become a Teachers College. Menomonie was founded about 1846 and chartered in 1882. Pop. 1920, 5,104; 1930, 5,595.

MENOPAUSE. *See* CLIMACTERIC.

MENORCA. *See* MINORCA.

MENSA (gen. *Mensae*), originally Mons Mensa, table mountain, the only bit of terrestrial geography represented in the sky. It was named in honor of the famous mountain that dominates Cape Town. Mensa is probably the most inconspicuous constellation in the sky, its only claim to fame being that it contains part of the large MAGELLANIC CLOUD. *See also* STAR: *map.*

MENSHEVIKS, the minority group of the Russian Social Democratic Party after 1903, derived from the Russian *menshinstvo,* meaning minority. Following J. O. Martov at the Second Congress of the party in 1903 in a matter of organization policy, a large number of delegates left the Congress as a dissenting minority. The faction left in control were then called BOLSHEVIKI, meaning majority. The Mensheviks, including LEON TROTSKY, opposed N. LENIN in his idea of centralizing party control; they drifted farther away from the Bolsheviks from 1905-17. Allied with the Social-Revolutionaries the Mensheviks gained control of the government by the revolution of Mar. 1917. However, their attempts to minimize the power of the Soviets completely alienated the peasants and laborers, and they were overthrown by the Bolsheviks in Nov. 1917. Thereafter they were unknown as an opposition party in Russia, although they remained a secret organization there; in Germany and France they became members of parties otherwise named. *See* RUSSIA, HISTORY OF.

MENSTRUATION, or **MENSES,** the discharge of blood from the vagina in women, occurring approximately every twenty-eight days. The bleeding is due to destruction of a portion of the womb lining, because the egg, which normally is expelled from one of the ovaries each month, is not fertilized by a male spermatozoön. If fertilization takes place, pregnancy results and menstruation does not normally occur. About 95% of all women have an interval of approximately 28 days between the menstrual periods, but some a longer or shorter interval, others a regular 21 day interval, while a number of women bleed regularly every 14 days. The average duration of the flow is about 5 days. Most women have some discomfort at this time, but in only a small percentage are the symptoms severe. Pain is the most troublesome accompaniment, but other annoying symptoms are headache, nervousness, lassitude, constipation, nausea, skin eruptions, sweating and mental disturbances.

Menstruation in women in the United States usually begins at about 14 years of age and usually continues until about 45 to 50 years. The earlier menstruation begins the longer it usually lasts. Radical changes take place in the entire body at the beginning

of menstruation (puberty) and at the time it ends (menopause), but these changes are not due to the presence or absence of bleeding, for the latter is only one of the changes.

There are instances in which the menses begin in early childhood (precocious menstruation) and they may continue in women past 60 years of age. Pregnancy is possible in both instances. Furthermore, the flow of blood may cease at the time of the change of life and recur after one or more years. Pregnancy is possible at this time also.

Normally, there is no menstruation before puberty and after the menopause, during pregnancy and for at least a certain part of the nursing period, after removal of the uterus or both ovaries by operation or after destruction of the function of the ovaries by roentgen rays or radium. During certain illnesses or after severe mental shocks the menstrual flow may be absent, whereas in other illnesses it is considerably increased. Bleeding occurring between the menstrual periods is nearly always abnormal and not considered as menstruation.

Some women never menstruate; this is usually due to absence of, or defects in, the reproductive organs. The absence of menstruation in itself is not detrimental to health. The belief that menstruation is a cleansing process whereby the body gets rid of noxious material is erroneous. The blood lost during the monthly flow is changed somewhat by the lining of the womb, but it is just as healthy and useful to the woman as the blood in the rest of the body. Vicarious menstruation refers to rare instances where bleeding takes place from organs other than the uterus, at periods corresponding with the usual menstrual periods. Painful menstruation is known as dysmenorrhea, too frequent menses as hypermenorrhea, too infrequent menses as hypomenorrhea and scanty flow as oligomenorrhea, profuse bleeding as polymenorrhea or menorrhagia and absence of the menses as amenorrhea. J. P. G.

MENSURATION, that branch of mathematics which treats of the measurement of plane or solid figures, that is, their length, area or volume, the name being derived from the Latin *mensura,* measure. Usually the term is applied to the body of rules for measuring as distinguished from theoretical geometry and from trigonometry. The following are some of the most common rules, the letters having the significance shown herewith.

A area	l length
b, b' upper and lower bases	L lateral area
c circumference	p perimeter
d diameter	r radius
e lateral edge, or element	s side
h height	S curve surface
$\pi = 3\ 1/7 = 3.1416$	V volume

LINES

Square	$s = \sqrt{A}$
Equilateral triangle	$h = \frac{1}{2} s\sqrt{3}$
Circle	$c = 2\pi r = \pi d$

AREAS OF PLANE FIGURES

Rectangle	$A = bh$
Parallelogram	$A = bh$
Square	$A = s^2$
Triangle	$A = \frac{1}{2}\ bh$
Equilateral triangle	$A = \frac{1}{4} s^2\sqrt{3}$
Trapezoid	$A = \frac{1}{2}\ h\ (b + b')$
Circle	$A = \frac{1}{2}\ rc = \pi r^2$

Taking a and b as the semidiameters of an ellipse,

$$A = \pi ab$$

Taking a, b, and c as the sides of a triangle, and s as half their sum,

$$A = \sqrt{s\ (s - a)\ (s - b)\ (s - c)}$$

AREAS OF SOLID FIGURES

Prism	$L = ep$
Regular pyramid	$L = \frac{1}{2}\ p \times$ slant height
Cylinder of revolution	$S = 2\pi rh$
Cone of revolution	$S = \frac{1}{2}\ c \times$ slant height
Sphere	$S = 4\pi r^2$

VOLUMES

Parallelepiped	$V = bh$
Prism or cylinder	$V = bh$
Cylinder of revolution	$V = \pi r^2 h$
Pyramid or cone	$V = 1/3\ bh$
Cone of revolution	$V = 1/3\ \pi r^2 h$
Sphere	$V = 4/3\ \pi r^3 = 1/6\ \pi d^3$

See MEASURES, UNITS OF; SIMPSON'S RULE FOR AREAS; SURVEYING.

MENTAL DEFICIENTS, EDUCATION OF. Mental defectives may be divided into two groups, those who are subnormal or mentally retarded and those classed as imbeciles or insane. The latter groups are cared for in private or public institutions supported by the state or county and do not come within the scope of this article. Efforts were made in the United States in the early 19th century to give the feeble minded the same education as the deaf and blind, but it was soon realized that the mentally defective were incapable of absorbing more than the rudiments of education in the generally accepted use of the term. Few are able to go beyond the primary grade curriculum. Nevertheless, much progress has been made in fitting these mental defectives to become self-supporting and useful citizens. The first work with the children is with beads, blocks and games, to train their eyes, ears and hands. Much stress is laid on manual training, and the older students are taught domestic work, the simpler trades and how to work on farms. Some of the institutions have their own farms and workshops and so provide work for the inmates on their own premises. Others limit their work to training their students to become self-supporting elsewhere. The care of mental defectives is controlled by the states and counties, even private institutions coming under their supervision with few exceptions. Most of the states support one or more state schools, and many of the cities provide for special

classes in their public schools for subnormal or mentally retarded students. The success in the training of these mental defectives has brought about a large increase in enrollment during the past decade. Outstanding schools in this field are those in Letchworth Village and Vineland, N.J. *See also* HANDICAPPED CLASSES. M. R.

MENTOR, in Greek mythology, son of Alcimus, and close friend of ODYSSEUS, who put him in charge of his home and son TELEMACHUS during his absence. Mentor discharged his duties so faithfully and wisely that his name has become synonymous with a trustworthy counsellor.

MENZEL, ADOLF FRIEDRICH ERDMANN VON (1815-1905), German illustrator and painter, was born at Breslau, Dec. 8, 1815. He worked in lithography and revived the art of wood engraving. Among his illustrations are those for Kugler's *History of Frederick the Great, The Soldiers of Frederick the Great* and the *Works of Frederick the Great.* Menzel's paintings, which deal chiefly with events in the life of Frederick the Great and scenes of everyday life, are keenly observed and realistically painted; a good example of his unswerving faithfulness in detail is his painting, *The Coronation of William I at Koenigsberg.* Menzel died at Berlin, Feb. 9, 1905.

MENZEL, WOLFGANG (1798-1873), German poet and historian, was born at Waldenburg, Silesia, June 21, 1798. After studying at Breslau and Bonn, his first book of poems, *Streckverse,* appeared in 1823. He published *Geschichte der Deutschen* in 1824-25. His great poetical popularity dates from *Rubezahl,* 1829, and *Narcissus,* 1830. *Furore,* 1851, is a story of the Thirty Years' War. Menzel also wrote histories of the German campaign of 1866 and of the Franco-Prussian War. He died Apr. 23, 1873.

MEPHISTOPHELES, the devil as represented in Goethe's *Faust* and Christopher Marlowe's *Dr. Faustus. See* FAUST.

MERCANTILE SYSTEM, a system achieving its height in 17th and 18th century Europe, which encouraged home industry and an export surplus and included one important economic fallacy, namely that MONEY—gold—is WEALTH. Mercantilists of all periods have been strong supporters of PROTECTION and a favorable BALANCE OF TRADE. One of the best examples of the system is the administration of France under Colbert. Under it, commercial policy encouraged exports by bounties, and discouraged imports by high duties. Colonies were developed both as markets for the exports of the mother country and as a source of raw materials, but they were forbidden to develop competing manufactures. The early relations between England and America, for instance, were determined by mercantilist policy on the part of England, and the revolt of the colonies (*see* UNITED STATES HISTORY) was in large measure incited by restrictions on colonial trade and manufactures.

Mercantilism was based on nationalism. Mercantilism always postulates a military state, self-supporting in time of war. This ideal was particularly important in the early period of nationalism, when the mercantile system was dominant, and provided exactly the type of assistance which the new nations, still struggling against medieval lack of unity, needed. The mercantile system then strove to develop a nation, independent of the resources of others, yet drawing in their wealth. Obviously a nation could accomplish this only by supplying all its own needs and supplying also the needs of others. The nation was therefore obliged to undersell competing nations in the world market. This led to an emphasis in mercantilist literature upon cheap labor as the necessary condition of low export prices.

The crudest type of mercantilist conceived only of exchange between two nations. England, for instance, must export to France more than it imported from her, and draw the balance back to England in the form of gold. Later the idea of a three-cornered exchange, which might still result in a favorable balance, was developed. England might import from America more than was exported, and by reexporting to France, still draw in a total surplus of gold. This is, in fact, what happened in the trade between England and the Colonies.

Adam Smith, in his *Wealth of Nations* was one of the first and most eminent opponents of the mercantile system. He attacked the fallacy that money is wealth, showing that the collection of money within a country merely raises prices. He outlined, too, the benefits of FREE TRADE, and with the adoption of this doctrine by his followers, free trade superseded the mercantile system in England in theory, and later in practice. E. W. G.

MERCAPTANS, a class of compounds, comprising thio-alcohols, hydrosulphides, thiols, which contain the monovalent radical —SH and are analogous to the alcohols with the oxygen replaced by sulphur. The aliphatic mercaptans may be prepared by action of potassium acid sulphide upon an alkyl halide or by passing an alcohol and H_2S over thoria and similar catalysts at about 380° C. They are more acids than alcohols and form mercaptides with metals, the lead mercaptides being used to identify mercaptans. They are readily oxidized to the alkyl disulphides. Their boiling points are much lower than the corresponding alcohols, due to their non-association. Their odor is very disagreeable and .000000002 milligrams may be detected by the nose, which is a smaller amount than required for a flame test. Aromatic mercaptans are formed by more difficult syntheses. Some of the anthraquinone mercaptans are used as dyes. *See also* THIO-COMPOUNDS. J. E. C.

MERCATOR, GERARDUS, or GERHARD KREMER (1512-94), Flemish mathematician and cartographer, born of German parentage, at Rupelmonde, Flanders, Mar. 5, 1512. He studied at Louvain where in 1534 he established a geographical office. From here in 1538 he issued his map of the world, consisting of two hemispheres, North and South. In 1541 he published the famous terrestrial

globe, and in 1551 his celestial globe. The following year he went to Germany to fill the chair of cosmography at the University of Duisburg, but this being discontinued, he remained henceforth in Germany as cosmographer to the Duke of Jülich. His map of Europe, issued in 1554, is the first giving scientifically ascertained content and approximately correct situations and frontiers of countries. Other maps were issued from time to time. In 1568 appeared his well-known planisphere for navigation on "Mercator's projection." In 1585, Mercator issued the first part of his Atlas, in which he united his different maps, this Atlas being completed by his son Rumold after his death. Mercator died at Duisburg, Dec. 2, 1594.

MERCED, a city in central California, county seat of Merced Co., situated 125 mi. southeast of San Francisco. It is served by buses and three railroads. The Richfield Oil Co. landing field is here. Merced lies in a fertile irrigated valley, between the Merced and the San Joaquin rivers, in a country which produces cotton, rice, vegetables, live stock, grain and fruit. The chief industries are dairying, the manufacture of clay and cement products, and meat and fruit packing. Situated near the Yosemite Valley and flanked by the Sierra Nevada Mountains on the east, the region is noted for its magnificent scenery. Founded by the Pacific Improvement Co. in 1872, Merced was incorporated in 1889. Pop. 1920, 3,974; 1930, 7,066.

MERCEDES, a city in Hidalgo Co. in southern Texas; situated about 6 mi. from the Rio Grande and 290 mi. southeast of San Antonio. Bus lines and the Missouri Pacific Railroad serve the city. Cotton, citrus fruits and vegetables are raised in the region. Among the chief industries are buttons and concrete pipe manufacture. Mercedes was founded in 1907. Pop. 1920, 3,414; 1930, 6,608.

MERCEDES, a town of Uruguay, situated a short distance above the mouth of the river of the same name, and about 150 mi. northeast of Montevideo, with which it has railroad connection. The chief product of the surrounding country is wheat. Est. pop. 1930, 30,000.

MERCERIZING, the process of treating COTTON with concentrated caustic alkalies. John Mercer discovered in 1844 that this treatment causes cotton fibers to shrink in length, increase in strength, and attain greater affinity for many dye-stuffs. In 1890, Lowe found that if the cotton be subjected to tension during the treatment with alkali, it acquires an increased luster. It is mainly to obtain this lustrous appearance that mercerizing is practiced at the present time.

Cotton is usually mercerized in the form of yarn and woven fabrics, although methods have been developed for treating loose cotton and ROVING. The process commonly employed is as follows: (1) The yarn or fabric is saturated with a solution containing about 25% of caustic soda for approximately one minute. (2) Sufficient tension is applied to the material to prevent shrinkage, or tension is applied after the material has been treated with the caustic solution. (3) The material while still under tension is washed with water to reduce the strength of the alkali below the point where it will cause shrinkage; otherwise maximum luster cannot be obtained.

Yarn may be mercerized either in the form of warps or skeins, the former practice being more common in the United States, and the latter in Europe. Equipment for mercerizing varies in design according to whether it is intended for used with piece goods, warps, or skeins. Essentially, it consists of a tank in which the goods are saturated with the caustic solution, squeeze rollers for expressing the excess solution, means for exerting the required tension on the yarn or fabric and facilities for washing the material free from alkali. W. W. C.

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MERCERSBURG ACADEMY, an institution for secondary education of boys at Mercersburg, Pa. Established in 1836 as a local academy, the school assumed national prominence under the leadership of Dr. William Mann Irvine, who took it over in 1893, and rebuilt the school, incorporating some of the better features of the English school system. The curriculum gives thorough preparation for universities, colleges and technical schools. The academy's assets are estimated at approximately $3,000,000. The average enrollment is about 550 with a faculty of 50.

MERCHANT, one who buys goods in quantities in order to sell them in smaller lots at a profit. He is concerned with supplying the material wants of people, and his success depends upon his understanding of what people want and a correct appraisal of what they are willing or able to pay. Modern business methods and the faculty of organizing his energies for this specific end are invaluable assets in merchandising.

A retail merchant sells directly to his customers. He may deal in a single line of goods, such as groceries, clothing or hardware, he may conduct a specialty shop, or a large department store carrying a widely diversified line of merchandise. His organization may consist only of himself, or he may have an elaborate corps of salesmen, accountants, buyers and other helpers. His market may be limited to his immediate neighborhood, or it may extend over a wide territory through a chain of stores or the use of mail and transport as in the case of mail order houses.

The modern development of CHAIN STORES has given their owners—usually a corporation—the price advantage derived from an immense buying power due to the greater number of people they are able to supply. They lack, however, the valuable and intimate personal contact which the independent local merchant has with his customers. Similarly situated is the merchant conducting a MAIL ORDER BUSINESS who displays his goods to remote customers through the medium of a printed catalogue. Standardized staple goods consequently constitute a larger proportion of their merchandise.

The wholesale merchant and jobber act as mid-

dlemen between the manufacturer and the retail merchant, depending upon domestic or foreign markets, or upon both. If an export merchant, or jobber he needs a special knowledge of foreign conditions, languages and tariffs. R. PL.

MERCHANT BANKERS, private banking houses in London which specialize in bills of acceptance. They do not engage in ordinary deposit banking and their transactions are international rather than local. Most of them originated as merchants engaged in export and import trade through which they became known in other countries. Small traders wishing to establish credit abroad but being unknown arranged for these merchants of international reputation to guarantee or accept their BILLS OF EXCHANGE for a commission. Eventually many of the merchant bankers ceased to function as merchants and dealt only in acceptances. To-day they also act as financial advisers to foreign countries, and issue loans for them. *See also* BANKERS ACCEPTANCES.

M. J. Q.

MERCHANT OF VENICE, THE, a comedy by SHAKESPEARE, produced about 1596, perhaps drawn from *The Jew,* a lost play of about 1579, and doubtless influenced by Marlowe's *Jew of Malta.* The different elements of the plot belong to a variety of old and widespread traditions. Antonio, a Venetian merchant, needing money for his friend, Bassanio, borrows from the notorious Jew, SHYLOCK, and signs a bond agreeing to forfeit a pound of his own flesh if the money be not returned within three months. The three months elapse, and Antonio, many of his ships having been reported as lost at sea, goes to Shylock, only to find the Jew a relentless creditor. But even as Shylock is sharpening his knife, Bassanio's sweetheart, PORTIA, enters, disguised as a learned advocate, and wholly convinces the court that the Jew may take no drop of Christian blood with the pound of flesh. The thwarted Jew is made still more to suffer when his daughter, Jessica, elopes with Lorenzo, Bassanio's friend. All ends happily—except for Shylock—with Bassanio winning Portia in marriage (after the famous casket scene), and Antonio assured by another report that many of his lost ships are saved.

MERCIA, an ancient kingdom of Anglo-Saxon England, originally occupying Derby, Stafford, Warwick, Nottingham and Leicester, but later all territory extending from the Thames to the Humber River, including London, with the exception of Danish East Anglia. Mercia was at first a dependency of NORTHUMBRIA, but in the same century its ruler Penda won its independence through victories over Edwin, King of Deira, and over Northumbria and Wessex. When Penda was slain by Oswio of Northumbria, Mercia was made subject to this king. In the 8th century under Ethelbald and Offa Mercia again had a period of prosperity, but after the latter's death Mercia became a part of Wessex.

MERCURIUS. *See* MERCURY.

MERCUROCHROME, a synthetic antiseptic. Attempts were made to prepare a compound which would combine the bactericidal properties of mercury compounds with the affinity for the kidney of phenolsulphonephthalein. Such a preparation is a salt of dibrom-oxymercurifluorescin, called mercurochrome.

This substance has proved successful as an antiseptic for the urinary tract because of its affinity for tissues, its non-irritating property, and its strong germicidal action. It has also been found to be an efficient antiseptic for skin wounds and other local applications, for which it is now extensively used.

MERCUROUS CHLORIDE, MILD. *See* CALOMEL.

MERCURY or MERCURIUS, in Roman mythology, the messenger of the gods, identified with the Greek HERMES, son of ZEUS and MAIA. He was also the god of commerce. Hermes is represented with wings on his sandals and cap, and as carrying a caduceus or wand.



MERCURY
By John of Bologna

MERCURY, the smallest, and innermost planet of the solar system. It revolves around the sun in 88 days at an average distance of 36 million miles, though its orbit is so elongated that the actual distance may vary from 29 to 43 million. Its distance from the earth ranges from 50 million to 136 million miles. Since the orbit of Mercury lies entirely inside that of the earth, we can never see the planet recede from the sun by more than a given angle, which varies from 18 to 28 degrees. Consequently, Mercury can be seen only shortly after sunset, or before sunrise, when it may appear as bright as a star of the first magnitude.

Like the moon, Mercury shows phases which can be easily seen through a telescope, and upon rare occasions, occurring about twelve times a century, the planet may pass directly between the earth and the sun and be seen crossing the sun's disk, appearing in transit as a small dark spot. The longest diameter of the elliptical orbit of Mercury turns around in space, faster than could be explained by Newton's theory of gravitation. This advance of the perihelion of Mercury, as it is called, has been explained and now constitutes one of the most important observational proofs for the theory of relativity.

Mercury is only 3,100 miles in diameter, 17 times smaller than the earth in volume, 25 times less in mass, while its density is 0.7 times that of the earth or 4 times that of water. At one time or another the existence of an intramercurial planet nearer to the sun than Mercury has been suspected, but observations made during a total eclipse of the sun have never shown a trace of such an object. W. J. L.

MERCURY, a silvery white metallic element, known also as *quicksilver,* symbol Hg. It has the peculiar characteristic of being liquid at ordinary temperatures. It is very coherent; its atomic weight is

200.61; specific gravity of 13.6; it freezes at about —39° C. and vaporizes at 360° C. It is found in natural form usually as cinnabar or red sulphide, HgS. It is found in a wide variety of formations of all ages, but it is produced in relatively few places, namely, California, Texas, Spain, Tuscany, Italy and Austria. Mercury is a good conductor of electricity and is used where a fluid conductor is desired. It forms AMALGAMS with many metals and is used in the extraction of gold and silver from ores. It expands uniformly with temperature increments and is widely used as a thermometer fluid. Mercury produces two series of salts, those derived from mercuric oxide (valence of two) and those from mercurous oxide (valence of one). Recently it has been used in a boiler, like water, as a medium for transforming heat into mechanical energy, and also as a heating medium in industrial processes such as oil refining.

Uses in Medicine. Mercury forms many compounds, some of which are very valuable in medicine:

Metallic mercury is not used in massive form, as it has little physiologic action; but when converted into a fine state of subdivision it is capable of absorption either by the skin or mucous membranes. Metallic mercury, therefore, finds use in medicine in the form of mercury in chalk, a gray powder, or as mass of mercury (blue mass), both of which are used as laxatives; in these preparations, the mercury is minutely divided. *Ointments of mercury* are employed for the destruction of lice or in the treatment of syphilis. A large number of salts of mercury are used in medicine, chief among them being the following: *Mercurous chloride* or *mild mercurous chloride* (calomel —Hg_2Cl_2), which is used as a cathartic, intestinal antiseptic, and as a diuretic to aid in the excretion of fluid in cardiac dropsy. *Mercuric chloride* or *corrosive mercuric chloride* (bichloride of mercury, corrosive sublimate—$HgCl_2$) consists of heavy colorless crystals or white power having an acrid and persistent metallic taste. It is slowly soluble in water and freely soluble in alcohol. Solutions of corrosive mercuric chloride are used chiefly as germicides and antiseptics, though at times mercuric chloride is used as a specific antisyphilitic agent. In common with all of the soluble mercury preparations, it is extremely poisonous when taken internally. *Ammoniated mercury* (white precipitate or mercurammonium chloride—$HgNH_2Cl$) is a white, odorless lump or powder with an earthy, metallic taste. It is a common ingredient in nostrums for removing freckles or bleaching the skin. In scientific medicine an ointment containing this substance is used for various diseases of the skin and for ringworm of the scalp. P. N. L.

MERCURY, FULMINATE OF, a gray crystalline powder, $(CNO)_2Hg$, highly explosive and very poisonous. It is formed by a combination of mercury and nitric acid, added to alcohol; the mixture, when poured into cold water, results in the precipitation of the mercury salt. Fulminate of mercury is used as a detonator for high explosives. (*See* DETONATORS.)

MERCURY QUARTZ VAPOR LAMPS: In medical therapeutics. *See* LIGHT, ARTIFICIAL, IN TREATMENT OF DISEASE.

MERCURY VAPOR BOILER, a BOILER used in mercury-steam BINARY CYCLE power generation for applying heat to MERCURY to vaporize it. The advantages of generating a vapor combining *high* temperature with a *low* boiling-point pressure to drive engines or turbines suggested the use of mercury, which at 70 pounds per square inch pressure boils at 880° F. The economy of operation lies in the saving of LATENT HEAT after the mechanical power producing stage. A specially designed water tube boiler is used. It has double tubes to facilitate circulation and minimize the quantity of mercury required. The great weight of mercury was of more importance in designing the equipment than were the operating pressures. The first installation was at Hartford, Conn., where a second unit has since been put into service. Others have since been built, and still others are contemplated. *See also* TURBINE, STEAM.

E. R. F.

MER DE GLACE, the most famous and, next to the Great Aletsch, the largest of Swiss glaciers. It descends the northern slope of Mt. Blanc above the picturesque valley of Chamonix. Three smaller glaciers unite to form this mountain "sea" of ice which covers 16 square miles. Its surface is broken by crevassing into a mass of fantastic ice-pinnacles and bladelike ridges, or *seracs,* especially on the lower slope, called *Glacier des Bois.* Compared with other glaciers, the Mer de Glace moves rapidly, progressing in summer at an average rate of about two feet a day. Its waters are borne by the Arveyron to the river Arve.

MEREDITH, EDWIN THOMAS (1876-1928), American agriculturist and cabinet member, was born at Avoca, Ia., Dec. 23, 1876. Educated at Highland Park College, he began his career in 1896 as editor of the *Farmers' Tribune,* at Des Moines, Ia., and in 1902 founded *Successful Farming.* In 1914 he was appointed to the Board of Excess Profit Advisors by Secretary of the Treasury McAdoo, and in 1919 made a member of the Industrial Conference. He served in the cabinet as secretary of agriculture during 1920-21. In 1924 and 1928 he was considered as a possible Democratic candidate for the Presidency. He died at Des Moines, Ia., June 17, 1928.

MEREDITH, GEORGE (1828-1909), British novelist and poet, was born Feb. 12, 1828 at Portsmouth, where his family for several generations had been tailors. He grew up and was educated in Germany. On going to London in his latter 'teens he determined upon a literary career but for a long time had to depend mainly on work for newspapers and publishers for an income. Possessing unquestioned genius and standing high among the greatest authors of his time, nevertheless Meredith was never a very popular writer. His most famous novels are *Diana of the Crossways, The Egoist, The Adventures of Harry Richmond* and *The Ordeal of Richard Feverel.* Among the titles of his collected poems are *Modern*

Love, a sonnet sequence; *Poems and Lyrics of the Joy of Earth* and *Ballads and Poems of Tragic Life.* Meredith's strongly individualistic style is characterized by mannerisms and obscurities, but he manipulated character, probed into its secret recesses, laid bare its motives and portrayed it with an ease and mastery, a subtlety of depiction and an emotional power scarcely equalled by his contemporaries. He died at Box Hill, Surrey, May 18, 1909.

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MEREDITH, OWEN. *See* LYTTON, EDWARD ROBERT, EARL OF.

MEREDITH, SIR WILLIAM RALPH (1840-1923), Canadian legislator, was born at Westminster, Ont., Mar. 31, 1840. He studied law at the University of Toronto, was admitted to the bar in 1861, and opened a law office in London, Ont. He was appointed city solicitor, elected a bencher of the Law Society of Ontario in 1871, and Queen's counsel in 1876. In 1872 he was chosen to represent London in the Ontario legislature. He was appointed chief justice of the common pleas division of Ontario in 1894, and in 1896 was knighted. He became chancellor of Toronto University in 1900, and was appointed chief justice of the Supreme Court of Ontario in 1912. He died at Toronto, Aug. 22, 1923.

MEREDITH COLLEGE, at Raleigh, N.C., a college for women chartered in 1891 and opened in 1899, is affiliated with the Baptist State Convention of North Carolina. Originally called the Baptist Female University, it was named Meredith College in 1910 in honor of Thomas Meredith, a Baptist pioneer in North Carolina. The productive funds in 1931 totaled $479,326. The library contained 16,097 volumes. In 1931 there were 407 students enrolled, and a faculty of 40, headed by Pres. Charles E. Brewer.

MEREZHKOVSKY, DMITRI SERGIEEVICH (1865-), Russian novelist, poet and philosopher, was born in St. Petersburg, Aug. 2, 1865, of noble parentage. He is known as the father of modernism in Russian literature. His work entitled *Of Symbols,* 1893, represented a revolt in verse against orthodox radicalism. He made a religion of Greek antiquity in his trilogy of historical novels, *Julian the Apostate,* 1895, *Leonardo da Vinci,* 1902, and *Peter and Alexis,* 1905. His later works include *Death of the Gods,* translated in 1926, and *December the Fourteenth,* translated 1931. After the Revolution of 1917 Merezhkovsky emigrated to Paris, adopting a strange mystic-messianic faith.

MERGANSER, a group (*Merginæ*) of fish-eating ducks with slender serrated bills. The true mergansers (*Mergus*) have slender bodies, usually crested heads, and long necks, and are remarkable divers. The plumage in the male is grayish with black and white wings, greenish-black on the head and creamy or pale salmon-colored below. Mergansers nest usually in hollow trees laying 6 to 10 creamy or buffy white eggs. Three species occur in North America, the American merganser (*M. americanus*), breeding chiefly from the northern states northward and wintering to Lower California, the Gulf coast and Bermuda, and the red-breasted merganser (*M. serrator*) of a similar range but more maritime. The closely allied hooded merganser (*Lophodytes cucullatus*), with a beautiful black and white crest, is somewhat smaller and ranges through North America generally.

MERGENTHALER, OTTMAR (1854-1899), American inventor, was born May 10, 1854, at Wurttemberg, Germany. He became a watch maker, and at an early age came to the United States, obtaining a government position at Washington, D.C., where he remained a short time and then moved to Baltimore, Md. Here he began a series of experiments which resulted, two years later, in his invention of a type-impression machine, the forerunner of the LINOTYPE. The efficiency of his machine was considerably increased by the improvements of Rogers and Dodge. The Mergenthaler Linotype Co. was organized to manufacture the machine, and production was begun in Cleveland, O. In modern form the Mergenthaler linotype is a type-setting machine which produces castings, each representing a line of type, and operated by pressing upon keys similar to those of a typewriter. Mergenthaler died at Baltimore, Oct. 28, 1899.

MERGER. *See* AMALGAMATION; COMBINATIONS AND MERGERS; MONOPOLY; TRUSTS; CARTEL.

MÉRIDA, a city of Mexico, and capital of the state of Yucatán, situated on the northern border of the Yucatán peninsula, 23 mi. south of Progreso, its port. The city is connected with the surrounding towns by a network of short narrow-gauge railroads, and its inhabitants are, in the main, Maya Indians. The vegetation of the surrounding country is scant because of a limestone formation which underlies the thin soil and is favorable to the cultivation of the maguey, cactus and other desert plants. Mérida is the center of the sisal fiber industry in Mexico. The cathedral faces on the main plaza and was built in 1598 and dedicated to San Ildefonso.

Mérida was founded on the site of an old Indian town named Tehoo, by Francisco de Montejo the younger. Built in 1549 on the site of the old Maya city, the Montejo mansion is still standing. Pop. 1921, 79,225; 1930, 106,890.

MERIDEN, a city in New Haven Co., south central Connecticut, situated about midway between New Haven and Hartford. It is served by the New Haven Railroad. Meriden, situated in a rich agricultural district, is a manufacturing city, especially noted for silverware and plate, cutlery, hardware, and metal fixtures, glassware, and firearms. The total value of manufactures, 1929, was about $36,000,000; the retail trade amounted to $17,762,161. The Hanging Hills which constitute a basaltic formation somewhat similar to the Palisades of the Hudson River, lie to the northwest, at an altitude of 1,200 ft., and, with Lake Merimere and Castle Craig, give the city a picturesque situation. The Connecticut School for Boys, a State reformatory, is located here. First settled in 1725, Meriden was part of Wallingford until 1806; the city charter was granted in 1867. Pop. 1920, 29,867; 1930, 38,481.

MERIDIAN, in geography, that great circle drawn on the surface of the earth through a given place and the poles, or, more restricted, only that half which contains the place itself. Thus, the meridian of Greenwich, the standard meridian from which longitude is reckoned, is that semicircle reaching from pole to pole and passing through Greenwich; the other half of it is the meridian of 180° longitude.

MERIDIAN, a city of eastern Mississippi, the county seat of Lauderdale Co., situated about 87 mi. east of Jackson. Four railroads, buses and an airport afford transportation. Surrounded by a rich lumbering and agricultural region, Meridian is an important trading and shipping center. In 1929 it was a leader in Mississippi in the value of manufactured products, with an output worth $8,887,922. Cottonseed oil, lumber, fertilizer, furniture and building materials were the largest items. Meridian also has railroad repair shops, creameries and packing houses, and is a wholesale trade center. The retail business in 1929 amounted to $14,435,765. Pop. 1920, 23,399; 1930, 31,954.

MERIDIAN CIRCLE, or **MURAL CIRCLE,** an astronomical instrument consisting of a TELESCOPE mounted on a pair of trunnions. The axes of the telescope and the trunnions are perpendicular to each other and the trunnions, which are horizontal, lie due east and west. On the trunnions is mounted a divided circle by which the rotation of the telescope about the axis of the trunnions can be measured. When the telescope is rotated, the line of sight traces the meridian in the sky. Two measurements relative to a star may be made with the meridian circle: the declination, which is the angular distance from the celestial equator to the star; the time of passage of the star across the meridian. In an earlier type of transit instrument, the divided circle was carried by a north and south wall which formed one of the trunnion supports, hence the name *mural circle.*

I. C. G.

MERIT, ORDER OF, an order founded in 1902 by King Edward VII of England. It carries no title but is an honor conferred on those of highest distinction in the military and naval affairs of the British Empire and those eminent in science and the arts. Membership is limited to 24 British subjects and certain foreigners chosen by the king. The badge, worn around the neck, is a red and blue enameled cross with the inscription "For Merit" in the center. A German Order for Merit was instituted in 1667 by Frederick I of Prussia. After 1740 it was an honor for those prominent in civil and military duties and in 1840 was extended to leaders in scientific and artistic pursuits. The members are restricted to 30 Germans and 30 foreigners.

MERIWETHER LEWIS NATIONAL MONUMENT, a tract of 300 acres in Lewis Co., Tenn. This monument, set aside Feb. 6, 1925 under the administration of the War Department, contains the grave of Captain Meriwether Lewis of the Lewis and Clark Expedition (1803-06) which crossed the then unknown northwest and reached the Pacific at the mouth of the Columbia River. It is about 6 mi. by motor road east of Hohenwald, which is on state highways, and the Nashville, Chattanooga and St. Louis Railroad.

MERLIN, in the ARTHURIAN LEGENDS, the powerful mage or enchanter who may possibly have been a Welsh bard of the 5th century. He appears as Ambrosius in a work by the Welsh historian, Nennius; but it was Geoffrey of Monmouth who gave Merlin his romantic character in *Vita Merlini* (c. 1140). Adapted to the Arthurian romance by the 13th century French poets, Merlin also figures prominently in Malory's MORTE D'ARTHUR, and in all subsequent versions of the cycle.

MERMAID TAVERN, THE, formerly a tavern founded in 1529 in Cheapside, London, between Friday Street and Bread Street, famous as a meeting place of wits and authors. In the early 17th century it was the favorite tavern of a club, traditionally founded by Sir Walter Raleigh, which included Ben Jonson, Beaumont, Fletcher, Selden, Carew, possibly Shakespeare, and others. Celebrated by Beaumont in his well-known *Lines to Ben Jonson,* the famous tavern was destroyed in the Great Fire, 1666.

MEROVINGIANS, the 1st dynasty of the Franks, whose authority over what is to-day France and part of western Germany prevailed from 496 to 752. Merovech, the founder of the dynasty, is thought to have led the *foederati* of Gaul under Aetius in the Battle of the Catalaunian Fields in 451. His grandson, CLOVIS, made himself the sole ruler of the Franks in 486. The dynasty fell when Pepin the Short in 752 deposed Childeric III and set himself up as King, founding thereby the CAROLINGIAN DYNASTY. *See* FRANCE, HISTORY OF.

MERRIAM, CLINTON HART (1855-), American biologist, was born in New York City, Dec. 5, 1855. Educated at Yale and Columbia he became naturalist in the geological survey of Idaho, Wyoming, Montana and Utah in 1872. After extensive scientific travel Merriam became head of the division of ornithology, afterwards the United States Biological Survey in 1885. He write widely on biological matters and later on the Pacific Coast Indians. His works include *Geographic Distribution of Life in North America, Distribution of Trees and Shrubs in the Deserts, Life Zones and Crop Zones of the U.S., The Dawn of the World.*

MERRICK, LEONARD (1864-), English author and playwright, was born at Belsize Park, London, Feb. 21, 1864. He was educated in private schools and at Brighton College, and became a leading British novelist and playwright. Among Merrick's works are *When the Lamps are Lighted, My Innocent Boy, The Elixir of Youth,* plays; and *Conrad in Quest of his Youth, When Love Flies Out o' the Window, Cynthia* and *The Little Dog Laughed,* 1930.

MERRIE ENGLAND, an expression meaning "pleasant" or "delightful" England. This applies also

in the case of "the merrie month of May" and similar expressions.

MERRILL, ELMER DREW (1876-), American botanist, born in East Auburn, Me., Oct. 15, 1876. He graduated from the University of Maine in 1898 with a B.S. degree and received his M.S. degree in 1904. His teaching career began as an assistant in the natural science department at the University of Maine in 1898. In 1899, he became an assistant agrostologist in the U.S. Department of Agriculture and was transferred as a botanist to the Bureau of Agriculture in Manila, P.I., in 1903. He served in the Bureau of Science there (1906-12) and was made assistant professor of botany and head of the department (1912-19). He was also a professor at the University of the Philippines (1916-19). Following this, he was director of the Bureau of Science at Manila (1919-23). He returned to the United States to become dean of the College of Agriculture and director of the Agricultural Experiment Station at the University of California (1923-29). He became director-in-chief of the New York Botanic Garden in 1930. Among his published writings are *Flora of Manila,* 1912; *Enumeration of Bornean Plants,* 1921; *Enumeration of Philippine Plants,* 1922-23, and numerous articles on the botany of North America, China, the Philippine Islands and Malaya.

MERRILL, a city in northern Wisconsin, the county seat of Lincoln Co., situated on the Wisconsin River where it meets the Prairie River, 18 mi. north of Wausau. The Chicago, Milwaukee, St. Paul and Pacific Railroad serves the city. Merrill is a shipping market for dairy products and lumber. The manufacture of lumber products is the chief industry. The surrounding country is very beautiful, abounding in game and fish. Merrill was settled in 1875, the village being called Jenny till 1883; it was chartered in 1883. Pop. 1920, 8,068; 1930, 8,458.

MERRIMACK RIVER, a stream of New Hampshire and Massachusetts, formed by the union of the Winnepesaukee and Pemigewasset near Franklin in central New Hampshire. It flows generally southward into Massachusetts and from Lowell follows a northeasterly course through Essex Co. to its mouth at Newburyport on the Atlantic coast. The extent of its drainage area is 4,864 sq. mi., the upper portion of which is a densely forested lacustrine country and the lower part a thickly settled industrial region. The river flows in a succession of still reaches and rapids over a length of 110 mi. and is important for the water power it furnishes for textile manufacturing at Lowell and Lawrence, Mass., and Manchester, N.H. Other important cities on its course are Nashua and Concord, N.H., and Haverhill, Mass. Steamboats of 200 tons can ascend this stream to Haverhill.

MERRY WIVES OF WINDSOR, THE, a roistering comedy by SHAKESPEARE, produced about 1599 and borrowed in many of its incidents from various Italian *novelle.* This work, said to have been written in answer to Queen Elizabeth's desire to see the elephantine Falstaff in love, deals with the uproarious situations which result when this clownish hero pays court to Mmes. Page and Ford, two middle-class wives of Windsor. The tricks played by these two ladies often reach great heights of vulgar humor—as when, for example, they conceal the over-confident swain in a basket of soiled linen, then promptly order basket and contents dumped into a ditch of dirty water. Falstaff is at last put completely to rout in a woodland scene at midnight, with mock fairies, in the course of which the love of Anne Page and Fenton is also brought to a happy climax. Other minor characters are Mistress Quickly, Pistol, Justice Shallow, the ridiculous Slender, and Falstaff's loutish follower, Bardolph.

MERSEY RIVER, an English river 70 mi. in length, formed in Cheshire by the confluence of the Goyt and Etherow. It passes through Longendale and the western district of Derbyshire. The Tame and Bollin rivers join it below Stockport where the Mersey becomes an estuary, narrowing at Liverpool and forming the harbor which is connected with the Manchester Ship Canal by the Eastham locks.

MERTHYR-TYDFIL, a municipal and county borough of Glamorganshire, south Wales, situated on the Taff in bleak, hilly countryside, about 176 mi. northwest of London. The place name traditionally derives from the martyrdom of St. Tydfil in the 5th century. The town's early history is one of plague and epidemic. Its modern development parallels the establishment and growth of ironworks from the middle of the 18th century; at Dowlais, the earliest of its four great ironworks, BESSEMER STEEL was first rolled into rails in 1856. To-day, Merthyr-Tydfil is a modernized town, with excellent hospitals, schools and public buildings. Pop. (of county borough) 1921, 80,116; 1931, 71,099.

MESA, the name given in southwestern United States to large isolated, table-topped rock masses, rising by abrupt escarpment cliffs from a flat region. The summit of these fortress hills is often miles in



COURTESY NATIONAL PARK SERVICE

THE GREAT MESA IN MONUMENT VALLEY, UTAH

extent. A small mesa, often weathered out of its typical fortlike form, is termed a BUTTE. Mesas and buttes are remnants of old eroded plateaus. They have persisted by virtue of a capping of hard rock, often lava, which protects softer strata beneath.

The most famous of these hills is the Enchanted

Mesa, rising sheer above a heap of fallen debris, some 23 miles from Albuquerque, New Mexico. In prehistoric times, primitive peoples made their homes on some of these seemingly inaccessible tablelands, probably ascending by toeholds cut in the cliffs. The Indian legend that the Enchanted Mesa was so inhabited received vindication in 1897, when archaeologists discovered on its summit abundant evidence of early occupation.

The largest of the mesas is Mesa Verde, in the southwestern corner of Colorado, since 1896 a National Park. The Mesa Verde is 15 mi. long and 8 mi. wide. In great natural caverns under the overhanging cliffs near the top are sheltered the ruins of "Cliff Palace" and other prehistoric communal dwellings. M. B. H.

MESA VERDE NATIONAL PARK, in southwestern Colorado, contains the most notable ruins of cliff dwellings in the United States if not in the world. The park was established by act of Congress, June 29, 1906 to preserve these remarkable vestiges of the former inhabitants of America and on June 30, 1913 was enlarged to its present area of 80.11 sq. mi.

Mesa Verde itself is one of the largest mesas in the southwest. It is 15 mi. long and 8 mi. wide and stands on the right bank of the Mancos River. The ruins are situated in the walls of small rough canyons which slope down from the top of the mesa toward the river.

The ruins were first discovered in Dec. 1888 by Richard and Alfred Wetherill, who were hunting lost cattle. They named their discovery Cliff Palace. The building is a characteristic community house containing over 200 dwelling rooms and 23 sacred kivas; at least 23 units or clans dwelt here.

Recent discoveries in Step House Cave indicate that early inhabitants of Mesa Verde belonged to what is known as late basketmaker culture, which was probably contemporaneous with if not antedating the beginning of the Christian era. Spruce Tree House, Balcony House and Sun Temple exemplify the highest development of cliff-house culture. According to Dr. Douglass's tree-ring chronology, Spruce Tree House was constructed between 1216 and 1261. The inhabitants of Mesa Verde possessed no written language and recorded their thoughts by a few symbols painted on earthenware jars or by picture writings scratched on cliff walls.



BALCONY HOUSE, MESA VERDE NATIONAL PARK, COLO.
The house contains 25 rooms and is one of the best preserved ruins in the park

A U.S. Interstate Highway leads into the park which is also reached from the Denver and Rio Grande Western Railway at Mancos.

Native dances, games and tribal songs presented by local Indians form an interesting part of the educational activities at this park. A museum containing collections of ancient relics taken from the ruins and also an excellent library are open throughout the year. Lectures are given at stated times by park naturalists who also conduct field trips and escort caravans of automobiles.

MESCALERO APACHE, one of the tribes of the Apache, a group speaking dialects of the Athapascan linguistic stock. Formerly they roamed between the Rio Grande and the Rio Pecos in New Mexico, as well as into the Staked Plains of Texas and into Coahuila in Mexico. They now live on a reservation in southern New Mexico. They are nomadic, living in skin-covered tipis, sometimes in brush shelters; they wear skin clothing resembling that of the Plains Indians, depend for food less on agriculture than on wild vegetable products, and when buffalo were obtainable hunted them in the plains. They made baskets and beadwork which were often indistinguishable from those produced by the Plains tribes. Their social organization was simple. Politically they were divided into small bands, each with a chief. Their religious ceremonies are somewhat similar to those of the nearby Pueblo tribes, since great stress is laid on the making of sand paintings, the strewing of cornmeal and pollen, and dancing by masked individuals.

MESENTERY, a broad band attached along the length of the intestine by which it is suspended in the abdominal cavity. It is composed of a fold of the peritoneum, which lines the abdominal cavity, together with the vessels, nerves, and lymphatics which pass to the intestine, the mesentery constituting the sole connection of the intestine with the rest of the body, except, of course, at its ends. The mesentery of certain parts of the intestinal tract, notably the duodenum and most of the large intestine, has been secondarily resorbed, so that these structures lie against the body wall behind. (For diagram *see* ABDOMEN. *See also* INTESTINES.)

MESHED or **MESHHED,** a city of Persia and capital of the Khurasan province, situated in the Ab-i-Meshed valley about 500 mi. east of Tehran. Once an old citadel, Meshed is now the residence of the provincial governors. Several trade routes cross here. In spite of the customs rates authorized by Russia and the railroad recently built from Samarkand to the Caspian Meshed still carries on business with India and Asia. Thousands of pilgrims every year come to see the tomb of Imam Riza, which is a marble mosque considered to be one of the finest in Persia. Shawls, carpets, swords, silk and braids are

the principal articles made in Meshed. Est. pop. 80,000.

MESMER, FRANZ ANTON (1733-1815), from whose name the word "mesmerism" was coined, was born at Weil, near Constance, on May 23, 1733. He studied medicine at Vienna. Mesmer's graduating treatise dealt with the subject of planetary influence on man (1771), and in experimenting with the magnet, he conceived the idea that the same power might be possessed by the hand. Attempting to practice mesmerism in Vienna, his private seances were investigated and he was compelled to leave the city in twenty-four hours. He attempted to hold his seances at Spa, but, after a series of failures there, moved to Paris in 1778. A feature of the mesmeric treatment was a number of so-called magnetic tubs containing a mixture of sulphide and other ingredients, and provided with iron conductors from which depended a ring for contact with the patients, who stood around the tubs joining hands. Mesmer's book on his treatment was published in 1779. He died at Meersburg in Switzerland on March 5, 1815. In London, Mesmer's charlatanry became manifest in James Graham's *Temple of Health*. M. F.

MESMERISM, a system of curing nervous disease practiced by Anton Mesmer (1733-1815). *See* ANIMAL MAGNETISM.

MESOLITHIC PERIOD (also called Epipalaeolithic) or Middle Stone Age, the period of transition between the Old Stone Age, when men were hunters, and the New Stone Age, when they had learned to polish their stone implements and had begun to domesticate animals, to practice primitive agriculture, and to make pottery. The first stages of each of these arts were probably passed by slow degrees in the Mesolithic Period. While man of the upper PALAEOLITHIC PERIOD was familiar with goats, cattle and horses, they were wild and were hunted as were deer. A first step may have been taken toward domestication when a well-fed hunter threw a bone to a wild dog, which thereupon lingered about the camp and later helped the hunter in the chase. Seeds from wild fruit brought to camp may have been cast out and may have germinated, thus suggesting agriculture.

The chief stages of Mesolithic culture are the AZILIAN, TARDENOISIAN and MAGLEMOSEAN, each of which is separately described. The Maglemosean marks a step forward, as remains of dogs have been found in the lake settlement at Maglemose. By that time men were thoroughly familiar with the use of the ax in felling trees for houses and the making of canoes. *See* ARCHAEOLOGY.

MESOPHYTE, a plant adapted to life under what may be termed average conditions of water supply. Ordinary field and garden plants are typical examples. Mesophytes are injured by prolonged flooding and can not endure drouth successfully beyond a limited time. A sharp distinction can not be made between mesophytes and xerophytes, or mesophytes and hydrophytes; the three groups merge into a continuous series and are recognized as a matter of convenience rather than distinct ecological types. Typical mesophytes have well-developed aeration tissue and comparatively broad thin leaves, with palisade on the upper side and a majority of the stomata on the lower surface. H. A. G.

MESOPOTAMIA, the name given by the Greeks to the extensive region enclosed by the Tigris and Euphrates rivers, anciently associated with the Assyrian and Babylonian monarchies. Prior to the World War it was under Turkish rule and comprised the vilayets of Basra, Bagdad and Mosul. During the World War the whole region was taken by the British, who were given a mandate over it. Under the name of Iraq it was established as a kingdom. *See* IRAQ. Pop., 2,849,282.

MESOZOIC ERA, the time of "middle or medieval life" in the long story of the rise of plants and animals upon the earth, the fourth era in geological history. So strikingly abundant was the reptilian life of the time that it has been called the "Age of Reptiles." The Mesozoic began perhaps 200,000,000 years ago and lasted for possibly 140,000,000 years, approximately 10% of all geological time. It is subdivided



CHARLES SCHUCHERT, OUTLINES OF HISTORICAL GEOL., JOHN WILEY & SONS

APPEARANCE OF NORTH AMERICA IN JURASSIC TIME

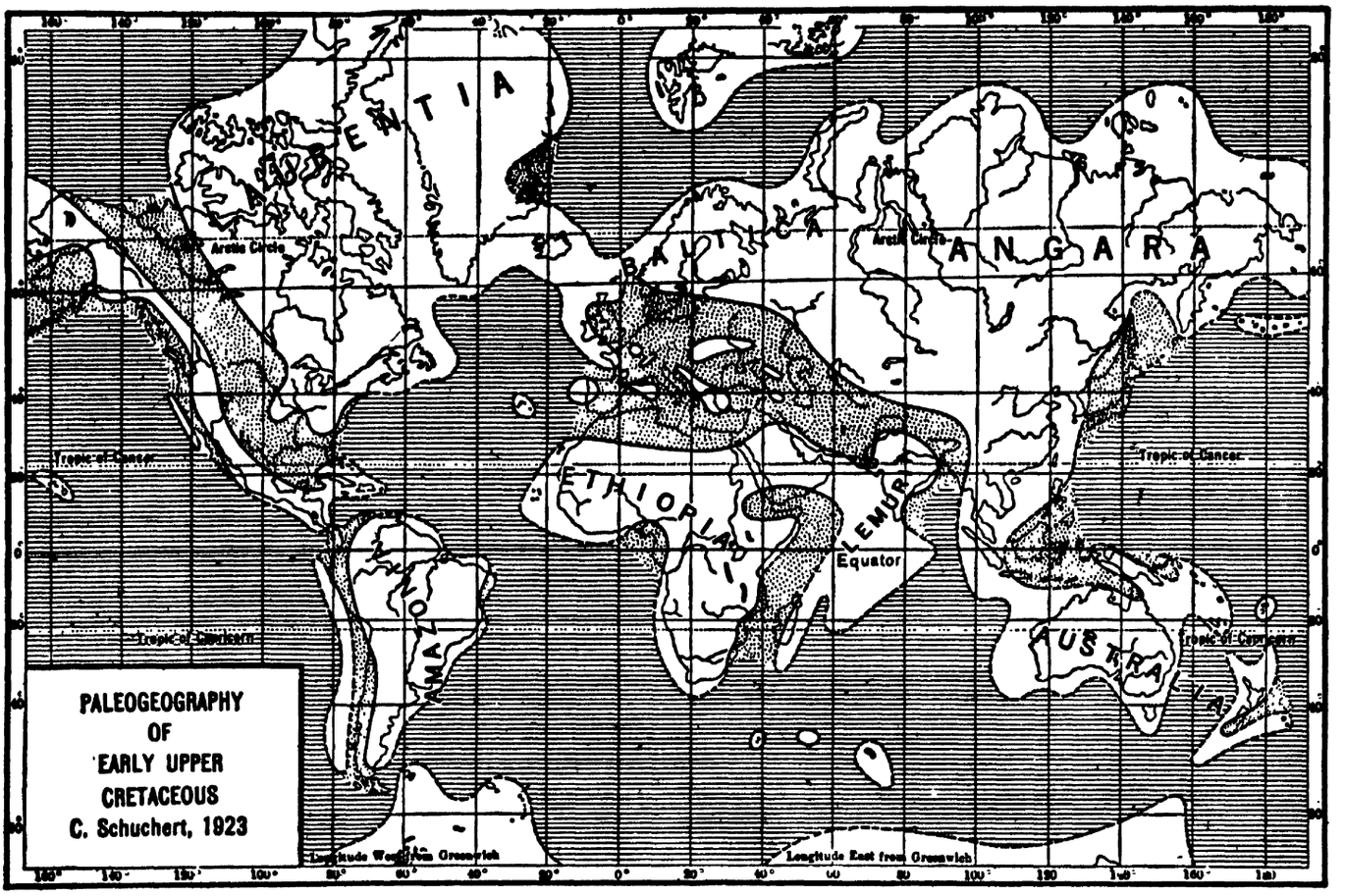
Epi-continental seas dotted; oceans ruled; lands in light, wavy lines. The mountains of the Pacific system were rising, the Appalachians were much worn down, and the Mississippi drainage was probably developing

into periods, the Triassic, Jurassic, Lower Cretaceous or Comanchean, and Upper Cretaceous or Cretaceous.

Dry land conditions with which the previous era, the PALEOZOIC, had closed persisted into the early Mesozoic. WEATHERING and EROSION of the elevated

land produced débris which were laid down in flood plain, river and lake as continental DEPOSITS. In the western central part of North America their character indicates an arid climate at first, which gradually became moister in the Jurassic. Throughout the Triassic and Jurassic there was a great sinking trough, or GEOSYNCLINE, on the site of the present Sierra Nevada mountains, which was invaded by the sea and filled with marine sedimentary rocks, principally limestone. These two periods of the early Mesozoic, the Triassic and Jurassic, were separated by a relatively minor disturbance in the east, the last one of any importance to affect eastern North America. There the crust was rush to California in 1849 were the result of the erosion of the gold veins formed at that time.

Following this, the seas again invaded the continental margins in the Comanchean, and the Gulf waters also spread northward into Mexico, Texas and Oklahoma. Renewed elevation then brought a period of erosion before the Cretaceous seas spread from the Gulf to the Arctic in the most widespread submergence the continent ever suffered. This ended when the Rocky Mountains and the Andes were raised in one of the greatest disturbances of the crust, the Laramide Revolution, which brought the Mesozoic to a close, just as the Appalachian Revolution had closed



FROM CHARLES SCHUCHERT, OUTLINES OF HISTORICAL GEOLOGY. JOHN WILEY & SONS

THE GREATEST KNOWN TRANSGRESSION (DOTTED) OF THE OCEANS (RULED) OVER THE LANDS

The time is early Upper Cretaceous. Laurentia, Baltica, and Angara make the continent known as Holarctica. Between Eurasia and Africa lay the great ancestral Mediterranean, Tethys

ruptured and fractured, and igneous rocks rose through the fissures, often welling forth as lavas. This incident is known as the Palisade disturbance, after the Palisades along the Hudson River, formed of one such intrusion. Increasing marine transgressions over the land marked the Jurassic, the Arctic ocean covering the Rocky Mountain States, western Canada and Alaska. This period was brought to an end by the geosynclinal trough mentioned above, being folded and thrust up by crustal disturbances to form the Sierra Nevada, Cascade, Coast Range and Klamath mountains. Tremendous intrusions of BATHOLITHS accompanied this unrest, and brought with them many of the ORE DEPOSITS now mined in the western States. The gold placer deposits which caused the

the Paleozoic Era. The end of the Mesozoic was also marked by increasingly cool climates, divided into zones, with a sufficient refrigeration to produce GLACIATION in Australia and Colorado.

In the organic world the changes were even more striking and radical. Most of the forms of life which had been so characteristic of the Paleozoic disappeared forever. The trilobites, eurypterids or "sea-scorpions," graptolites and simple corals were gone, while the crinoids, or "sea lilies," the echinids or "sea urchins," and the brachiopods persisted in modified forms. These new forms, in turn, were characteristic of the new era and resembled more nearly the ones familiar to-day. In the Jurassic the "sea lilies" attained great size and beauty, while throughout the

Mesozoic the seas swarmed with cephalopods. Related to modern nautilus and squid, these cephalopods lived in coiled shells separated into chambers by successive dividing walls characteristically warped. These types, known as ammonites, were typical of the era, and did not survive its close. Lobsters appeared in the Triassic, followed by ancestors of modern crabs in the Jurassic. On land few insects are known in the Triassic, but their abundance in the Jurassic period indicates that they probably arose in the earlier one.



FROM CHARLES SCHUCHERT, OUTLINES OF HISTORICAL GEOLOGY, JOHN WILEY & SONS

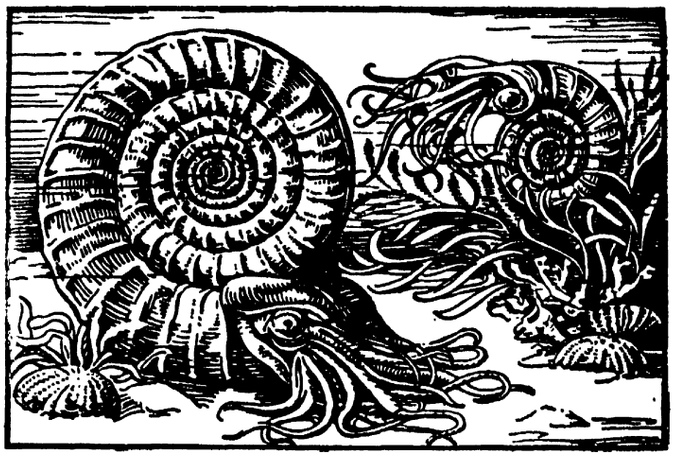
LATE CRETACEOUS PALEOPHYSIOGRAPHY

(The oceans are ruled; the lands are in wavy lines.) The continent is completely emergent, and in the west it is newly risen into the Rocky, Cordilleran and Pacific mountains, while in the east the Appalachian area is again domed. Antillia and Central America also are mountainous. The black spot is the area of latest Cretaceous fresh-water deposits. The drainage of the Mississippi system is well established

The insect stem is thought to have developed from some form of early Paleozoic trilobite. Grasshoppers, locusts, cockroaches, ants, beetles and wasps are among the forms known.

The flower-visiting insects could not develop, of course, until flowering plants appeared in important numbers, which occurred in the Cretaceous period. Prior to that the Paleozoic vegetation was still dominant, composed of the gymnosperm or non-flowering, naked-seed types. Evergreens, ferns and rushes were typical representatives. In the Cretaceous, however, flowering plants became important, after a long period of development which left only occasional, straggling fossils as witness of their existence. In the cool climates closing the era the grasses, fruits and cereals spread widely over the land, a development of a food supply of great significance because it permitted the evolution of the higher mammals.

Among the vertebrates, the fish underwent some modifications, most important of which was the appearance in the Cretaceous of the teleosts, or modern



JURASSIC AMMONITES IN LIFE
After Fraas

bony-skeleton type, such as the herring, cod, salmon and catfish. The land descendants of the primitive fish, the amphibians, are seldom of much importance after the Triassic.

The story of the rise and fall of the reptiles, the dominant life of the Mesozoic, is one of the most fascinating life histories of all geological time. From primitive land dwellers they spread until they ruled the land, the seas, and the air; 18 great reptilian stocks were the highest expression of life up to that time, but lizards, turtles, snakes and crocodiles are now practically their sole survivors. The dinosaurs were the most significant forms, yet even they were rela-



COURTESY AMER. MUS. OF NATL. HISTORY

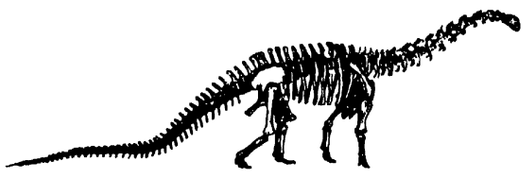
FOSSILIZED NEST OF 13 DINOSAUR EGGS FROM MONGOLIA

tively stupid, the largest weighing about 40 tons, of which only one pound was brain. All the continents of the world were occupied by these animals, but they are known best from fossils in North America, Europe, Africa and Mongolia.

There were two great groups of dinosaurs, the carnivorous and the herbivorous. The earliest known,

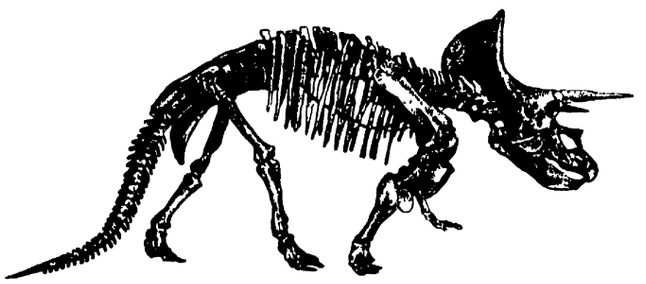
which persisted throughout the Mesozoic, were the carnivorous ones. They walked on their hind legs, balanced by a huge tail, like the kangaroo, but had very small fore limbs. These carnivores varied from the size of a chicken to the tremendous *Tyrannosaurus Rex* which measured 40 feet in length, and possessed teeth as much as six inches in length. This "Tyrant King of the Reptiles" was probably the most terrible living engine of death the world has ever seen.

Among the comparatively harmless herbivores, there were some that walked on their hind legs, too, and probably depended on their speed to escape such enemies as *Tyrannosaurus.* The biggest animals that ever inhabited the land were the quadrupedal, vege-



BRONTOSAURUS
Model of skeleton

tation-eating dinosaurs, such as the *Gigantosaurus* of Africa, and his American relative, *Brontosaurus,* who grew to a length of 80 feet and stood 16 feet. Some of the smaller herbivorous types developed bizarre armor, such as rows of upright, bony plates down the spine, or bony frills extending from the base of the skull over the neck, and horns on the head.

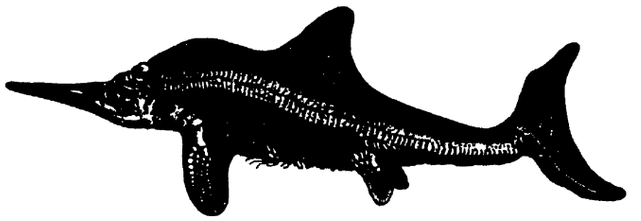


SKELETON OF TRICERATOPS
Cretaceous dinosaur found in Montana. It is 24 ft. long, 7 ft. 9 in. in height and, when alive, probably weighed 10 tons

From the land, the reptilian domination spread to the sea and the air. Marine reptiles developed, some with fish-like bodies, others with short, stout bodies and tails but long necks and small heads, and still others with long slender bodies and scaly skins. In the air the *Pterosaurs,* or Pterodactyls, flew about on bat-like wings, some with tails, others tailless, but all with short bodies, hollow bones and large heads. Pterodactyls with wing spreads of 25 feet are believed to have existed.

The earliest known bird remains are found in Jurassic rocks, and give abundant proof of their reptilian ancestry. It is thought by some that they developed from a bipedal, running form of primitive dinosaur. Archeopteryx, for example, had a toothed jaw, claws on its wings, and a vertebral column extending into its tail. More modern types of birds appeared in the Cretaceous.

A few remains of animals intermediate between reptiles and mammals are found in the Mesozoic rocks, as well as several groups of archaic mammals. Thus,



COURTESY AMER. MUS. OF NATL HISTORY

ICHTHYOSAUR, A MESOZOIC MARINE REPTILE
Skeleton and body outline

all five groups of vertebrates existed in this era of medieval life, fishes, amphibians, reptiles, birds and mammals, but while it lasted the age belonged to the reptiles. Land connections between continents now separated, facilitated their migration and wide dispersal.

A simple, one-celled group of animals, the foraminifera, swarmed on the seas of Cretaceous time, their remains accumulating into great beds of CHALK, for which the period is named. They form the chalk cliffs of Dover. Another economic deposit was COAL, now found in extensive beds, especially in western North America.

The drier, colder world that came into being as the Mesozoic closed with the Laramide Revolution was probably uninhabitable for most of the reptiles, and they were well-nigh swept from the stage of life which was thus cleared for the next great experiment, the rise of mammals in the CENOZOIC ERA. *See also* EVOLUTION; GEOLOGY; PALEONTOLOGY. S. F. K.

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MESQUITE (*Prosopis juliflora* var. *glandulosa*), a small thorny tree of the pea family allied to the mimosas. It is found from southern Kansas to southern California and southward to Mexico. In many arid districts it is the chief woody plant, forming a characteristic part of desert vegetation. A striking feature of the mesquite is its enormous root system composed of many spreading horizontal roots and a huge taproot which commonly descends to water 40 to 60 ft. below the surface. Though sometimes only a low shrub, the mesquite often becomes a round-topped tree 20 ft. high with a trunk a foot in diameter. The drooping branches bear leaves divided into numerous paired leaflets; small fragrant greenish-yellow flowers in dense narrow clusters, and long bean-like pods with a sweet edible pulp surrounding the seeds. Mesquite wood, which is very hard and durable, serves many local uses; the im-



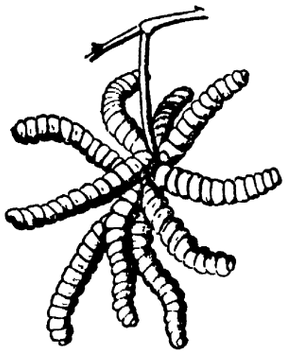
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CHARACTERISTIC TYPES OF MESOZOIC LIFE

1. Flying reptiles and primitive birds. (Painting by Charles R. Knight from fossils found in the slate quarries of Bavaria.) The reptiles' wings were formed of a thin skin attached to the side of the body and to the slender horns of the foreleg and the elongated fourth finger. Three fingers were short and bore claws for grasping tree branches. The birds were feathered, but had teeth, and the tail was an extension of the backbone. The wing had claws like the reptiles' to use in holding to branches. **2.** Vertebrates of the chalk seas of Kansas. The long-necked reptile attacking the wingless reptilian birds (*Hesperornis*) is a plesiosaur (*Elasmosaurus*); the flying reptiles on the left are pterodactyls; on the right is a fish-lizard (*Ichthyosaurus*) attacking the winged reptilian bird *Ichthyornis*. **3.** Fossil ammonites of Jurassic time from the Black Hills, South Dakota. **4.** *Tyrannosaurus rex* about to attack a family of *Triceratops horridus*. (Painting by Charles R. Knight from fossils found in Hell Creek Basin, Montana.)

mense roots are utilized for fuel. Mexicans and Indians obtain nutritious food from the sugary pods, which form excellent forage for grazing animals.

The similar but larger screw-bean mesquite (*P. pubescens*), with smaller, somewhat downy leaves, stouter spines and coiled pods grouped in clusters, grows in sandy washes from Death Valley southward to the Colorado desert and eastward to New Mexico.



OM JEPSON MAN FL. PLANTS
CALIF. COPYRIGHT

SCREW-BEAN MESQUITE
Cluster of ripe pods

MESS. On board ship the messes are the General Mess, the Flag Officers' Mess, the Commanding Officers' Mess, the Wardroom Officers' Mess, the Junior Officers' Mess, the Chief Warrant and Warrant Officers' Mess and the Chief Petty Officers' Mess.

The Supply Officer of the ship has charge of the General Mess, and of the various commissary stewards, cooks, bakers, and men detailed for duty in the ship's galley and supply department. A separate mess is formed for Chief Petty Officers, and the other Petty Officers. Enlisted men and marines are arranged in one general mess divided into sub-messes of 20 as nearly as possible. Messmen are always detailed from the lower ratings. Flag officers and also sometimes, the commanding officer of the vessel may, if they so desire, have their own flag staff mess with them. In the various officers' messes the Senior Line Officer present in line of succession to the Command presides, and has the power to preserve order. Wardroom officers may form a "Cigar Mess," of which all commissioned and warrant officers attached to the ship may become members upon payment of the mess entrance fee, but no officer shall be required to become a member thereof. The "Cigar Mess" takes the place of the "Wine Mess" allowed before July 1, 1914.

R. E. C.

MESSAPIAN, an extinct INDO-EUROPEAN language once spoken in the area roughly corresponding to modern Calabria in Italy, and preserved in numerous short inscriptions and a few glosses. It would seem to have belonged to the ILLYRIAN family.

MESSIAH (Hebrew *mashiah,* meaning the anointed one), the future descendant of the royal house of David, ancient King of Israel, who, according to the belief of the later Hebrews, was to become the national leader of Israel. The Messiah was to lay low the external enemies of Israel; lead Israel back from exile to its own land; rule with clemency over the people of Israel itself, and usher in a period of national splendor and greatness which would recompense Israel for all its past sufferings, and an epoch of piety, peace and goodness for all the nations of the earth.

Originally the word Messiah meant only anointed one, and was applied to the kings of Israel and Judah, who were usually anointed with olive-oil (I Samuel 2:10, 35; II Chronicles 6:42), and to the high priest (Leviticus 4:3, 5; 6:5). Deutero-Isaiah, however, called Cyrus, King of Persia, the anointed one of God (Isaiah 45:1), because God had granted Cyrus the strength to destroy Babylonia and free Israel from exile, as a result of which the prophet confidently expected the era of the universal rule of God to be ushered in very soon. In Psalm 105:15 the anointed ones of God are regarded as equal to the prophets, in that they are protected by him.

Later, however, especially after Israel had lost its independence and was subjected to the harsh oppression of foreign nations, the idea developed that the Messiah would be a military leader, a bodily descendant of the tribe and house of David (i.e. of the tribe of Judah), who would unite all Israel, throw off the enemy's yoke, and establish a reign of peace, justice and righteousness. It is to be emphasized, however, that from the very beginning the Hebrews conceived of the Messiah as a human being, a corporeal scion of the house of David, and regarded the kingdom which he would soon establish as being here on earth, not in a future world or sometime after death. So important did this belief in a Messiah become in later years, as time went on and the persecutions suffered by Israel still continued unabated, that in all the post-Exilic and post-Biblical centuries through the period of the TALMUD and of the Geonim (*see* GAON), it was one of the important and vital essentials of Jewish religious faith; as late as the end of the 12th century MOSES MAIMONIDES made it the last of his Thirteen Articles of Faith. Christianity took its ideas of the Messiah essentially from this Hebrew ideal, but added the feature that the Messiah was not human, but divine, and that the kingdom which he would found would be a heavenly kingdom. Indeed, Christianity itself had its origin directly in Jewish life, and was started by Jews out of the Jewish hope for a Messiah.

Particular attention is to be called to Isaiah's idea of the Messiah (Isaiah 9:1-6; 11:1-10; 32:1-5): the Messiah would rule his people wisely, in the fear of God; wars would soon be no more, and the instruments of war would be converted into farming implements; innocence and morality would dwell once more upon the earth in the form of righteous and moral inhabitants, and the wise justice of the Messianic human king would rule over all lands. Such ideas were held by all the literary prophets. The Messianic idea was further elaborated in certain books of the Apocrypha and Pseudepigrapha. Still later, it was incorporated in the daily prayer-book, and is still recited, and believed in, but not with any great fervor, by the masses of the Jewish people to-day. However, Reform Jews no longer believe in the coming of a personal, human Messiah, a descendant of the house of David, but in a future Messianic period, when the prophetic ideals will be realized, when all mankind will be at peace and the reign of justice, tolerance

and righteousness, mutual aid and peace, will be established on earth for all time and among all nations.

A. Sh.

BIBLIOGRAPHY.—L. Dennefeld, *Le Messianisme,* 1929; Hugo Gressmann, *Der Messias,* 1929.

MESSIAHS, FALSE. *See* Pseudo-Messiahs, Jewish.

MESSINA, a city and port of Sicily, capital of the province of the same name, situated on the Strait of Messina, about 200 mi. southeast of Naples, Italy. It has a fine harbor which is protected by a peninsula curving round it like a sickle. Messina has suffered from earthquakes several times, the most disastrous disturbance occurring on Dec. 28, 1908. Practically the entire city was destroyed, and over 80,000 inhabitants lost their lives. The imposing 11th-12th century cathedral and many other historic buildings were almost totally ruined. Previous to this catastrophe, Messina was a prosperous port with many pleasant streets and promenades. Now largely rebuilt, it lacks much of the charm of the old town, and is chiefly important as a manufacturing and shipping center.

In history Messina has had a checkered career. It was founded by pirates about 700 B.C. It passed to the rule of powerful Sicilian towns and, in the 3rd century B.C., to Rome. The Saracens captured the city in 831 A.D., but in the 11th century it fell to the Norman invaders of Sicily. Thenceforth it belonged to the German Empire, Spain, France (French forces occupying the city for only a short time) and, since 1860, to Italy. Pop. 1931, 182,508.

MESSINA, STRAIT OF, a strait between Italy and Sicily, connecting the Ionian with the Tyrrhenian Sea. Its length is about 20 mi. and its width varies from 2 to 12 mi. There is a strong tidal current through the deep channel. In ancient times, the difficulty of navigating the strait gave rise to the belief that two monsters, Scylla and Charybdis, guarded the passage.

MESTROVIC, IVAN (1883-), Jugoslav sculptor, was born in Verpolye, in 1883, of Croatian parents. He studied in the Vienna Academy of Arts under Hellmer. Mestrovic attained prominence with the exhibition of his national heroes in the Serbian Pavilion of the Roman International Exposition of 1911. He exhibited in London in 1915, and in America in 1924-25. His important works include the Kossovo Memorial in Belgrade; a mausoleum with over 60 sculptural works near Dubrovnik, Dalmatia; the bronze figure of Victory on the Turkish fortress at Belgrade, and many Madonnas and portrait busts. Mestrovic executed two bronze sculptures of mounted American Indians for the city of Chicago, and designed the Woodrow Wilson medal awarded to Lord Robert Cecil by the Woodrow Wilson Foundation.

METABOLISM, the chemical transformations of the combustible materials of the animal or plant body and its ingested food, which result in the exchange of potential energy for heat and work, together with exchanges of non-combustible inorganic materials.

The energy of all the higher forms of life is derived principally from three major food factors, carbohydrate, protein, and fat. Carbohydrates, converted to glucose by digestion, are absorbed as such, are deposited as glycogen (animal starch) or are reduced to fat and stored as fat, or undergo oxidation. The heat liberated by this oxidation approximates 4.1 large calories for each gram. Protein, split by digestion into the chemically less complex amino-acids, may be resynthesized to the protein characteristic of the organism, or, after further simplification by loss of nitrogen, oxidized to liberate heat. Each gram yields 4.1 large calories on oxidation. Fat is either stored in various depots, or is oxidized, with a heat production, in the latter case, of 9.3 calories for each gram. The nuclear material of food and body tissue provides the elements of purine metabolism with its end stage, in the case of man, of uric acid. Muscle yields creatin and creatinin.

Total metabolism is the sum of the heat liberated by all of these and other reactions. It depends mainly on the rate at which oxidation proceeds and is influenced chiefly by the amount of work performed: a seamstress might produce no more than 1,500 large calories a day; a woodman might expend 5,000 large calories. The total is made up of the *basal metabolism,* which is the energy required to maintain the biological activities that continue when the body as a whole is at rest, a quota of extra energy required for the performance of work and a quota which is the result of stimulation of metabolism by food taking. The last is known as the specific dynamic action of food. It is highest after protein meals, less for carbohydrate and least for fat.

The rate of *basal metabolism* is conventionally measured under standardized conditions of rest, fasting and warmth. This measurement is now spoken of as the "standard metabolism." The actual basal metabolism, if we mean by this the rate of heat production at rest, is variable, being depressed by sleep or prolonged fasting and elevated by exposure to cold and by emotional reactions. The standard metabolism is amazingly constant for individuals of like age and sex, and is directly proportional to the surface area of the body. It decreases as age advances and is about 7% higher in men than women. (*See also* Diet and Dietetics.)

The rate of metabolism (calories per hour) may be measured directly, or determined either from carbon dioxide production or oxygen consumption. *Direct* measurement involves the use of a respiration calorimeter (*see* Calorimetry) sufficiently capacious to enclose the entire body. The first apparatus of this kind, for use with men, was developed by Atwater and Rosa in 1897. Heat elimination was determined by noting the difference in the temperature of a stream of water as it entered and left the calorimeter through a system of pipes, with due regard to the increase in moisture content of the air in the calorimeter. The *indirect* methods which depend upon the measurement of the respiratory gases, either oxygen or carbon dioxide or both, make use of smaller apparatus to

which the subject is connected by means of a mask or mouth piece and nose clip. In all cases the calories determined are referred to normal standards of heat production, such as those of F. A. Benedict or E. F. DuBois, and the metabolic rate is then expressed as a percentage plus or minus of the standard.

In the diseases of metabolism, one or more of the mechanisms for maintaining normal metabolism are disordered. Very often this results from some disturbance of a gland of internal secretion, whereby the supply of some HORMONE or catalyser is either increased or decreased. Thus in hyperthyroidism, from GOITER, an excessive production of the hormone thyroxin causes acceleration of all the oxidative phenomena and elevation of the basal metabolic rate. The opposite condition of inadequate thyroid hormone is present in CRETINISM and MYXEDEMA. (*See* THYROID GLAND.) So also in DIABETES MELLITUS, a deficiency of INSULIN disturbs the chemical reactions whereby sugar is utilized. The anomalies of growth and sexuality which result from disease of the PITUITARY GLAND belong in this category, as do also disorders such as OBESITY, DIABETES INSIPIDUS and GOUT.

R. M. W.

BIBLIOGRAPHY.—E. F. DuBois, *Basal Metabolism in Health and Disease*, second edition, 1929; G. Lusk, *The Science of Nutrition*, fourth edition, 1928; S. J. Thaunhauser, *Lehrbuch des Stoffwechsels und der Stoffwechselkrankheiten*, J. F. Bergman, Munchen, 1929.

METAL COATINGS, thin metallic layers, applied on the surface of materials as protection against corrosion and sometimes for mechanical, electrical or decorative purposes. The oldest method for their application is to immerse the base metal in a molten bath of another metal. Thousands of tons of zinc are thus yearly applied on iron and steel as protection against corrosion, by hot GALVANIZING. In hot tinning the more expensive tin is used for the protection of iron, steel, copper and its alloys, against corrosion. These tin coatings are extremely resistant to atmospheric attack. They are used in contact with food products, because they are resistant to fruit acids, etc., and their compounds are nontoxic. Molten tin is also sometimes rubbed on copper sheet by a hand process. Lead, aluminum, and, lately, cadmium coatings are being produced by immersion methods.

Various methods of electro-plating are universally used. The principle of these methods is to immerse the object to be coated in solutions of metal compounds, which are then decomposed by an electric current with deposition of the metal. As this process works at normal or only moderately elevated temperatures, non-metallic objects can be metal coated in this manner. A large number of metals are commercially deposited by electro-plating. The most important ones are, gold, silver, copper, tin, lead, nickel, chromium, cadmium and zinc. Some of these, such as tin and silver, are also deposited from their solutions upon objects by mere immersion without application of electric current.

By means of metal spraying practically every metal can be deposited on practically any object whether metallic or nonmetallic, even on ceramics, textiles, paper or other combustibles. Metal wires, or in some cases, metal dust are melted in special portable machines by oxy-acetylene or oxy-hydrogen flames. A blast of compressed air atomizes the particles of molten metal and impacts them upon the surface to be coated. The metals most commonly used in this process are zinc, cadmium, aluminum, lead and copper.

In CEMENTATION methods the objects are brought in intimate contact with the powdered coating metal at high temperatures. Zinc coatings are thus produced by sherardizing, aluminum coatings by calorizing, chromium coatings by chromizing.

In mechanical methods the coating metal, brought in contact with the base at an early stage of the production, is united with it by rolling or drawing. Steel is thus coated with copper, aluminum alloys with pure aluminum, copper with silver, etc.

L. PE.

See H. S. Rawdon, *Protective Metallic Coatings.*

METAL CUTTING, BY HEAT, a method of cutting metal, usually by a gas torch. *See also* GAS FLAME CUTTING. There are, however, some fields of cutting, such as removing the "risers" from steel ingots, where advantages are claimed for the electric arc. Gas torches in the hands of skillful operators can accomplish remarkable work. *See also* WELDING. Friction saws—a disc like a toothless circular saw is run at very high speed, the heat of friction cutting off the end—are also used to some extent for cutting the ends from rails in steel rolling mills.

METALLOGRAPHY, the study of the composition and structure of metals and alloys and their effects upon the physical properties. The oldest method of examining the structure of metals is by studying the size and arrangement of crystals in a fracture. Examination of the polished and etched surface with a microscope has been supplemented by photography through the microscope. X-ray machines are used for making fundamental studies of structure.

METALLURGICAL FURNACES. *See* FURNACES, METALLURGICAL.

METALLURGY, the art of extracting a metal from its ore, treating and purifying it. Metal is usually extracted by a combination of mechanical and chemical processes. There are two important methods of mechanical separation, (1) by gravity, in which the finely crushed ore is suspended in a fluid, such that the heavier metal particles sink to the bottom while the lighter non-metallic substances are washed off; and (2) by the flotation process. Crushed ore is placed in a suspension of oil in water. The mixture is stirred and the finely separated oil particles carry the metal to the surface. Other mechanical methods may be used for certain metals. Metals having magnetic properties may be separated by the use of electromagnets. Mechanical methods must, in most cases, be supplemented by chemical processes. There are three usual methods of chemically extracting minerals from ore.

(1) The ore may be heated with an excess of air, thus oxidizing some of the substances in the ore and removing them as gases. In the "roasting" process the sulphur of the ore is burned off. Or the ore may be heated together with reducing agents—such as carbon—which combines with the oxides, thus removing the oxygen from the ore. This reducing action may supplement the oxidization, i.e., the ore may be first oxidized to remove some elements and then reduced to remove the oxygen. Or the ore mixed with some flux may be fused and the metal separated out by ELECTROLYSIS.

(2) The ore may be mixed with mercury. The mercury and metal amalgamate and are mechanically separated from the dross. The amalgamated product is then distilled and the mercury recovered while the metal remains. This method may be used in separating metals such as bismuth and sometimes gold and silver from their ores.

(3) In some instances a wet process is applied. An acid, salt or alkaline solution is used and the metal is chemically precipitated from the solution.

These methods of extracting the metal from an ore are commercial, in contradistinction to laboratory methods. Consequently it is rarely possible to extract the metal in its pure form, and it is usually necessary to submit it to a subsequent refining process to eliminate the more harmful impurities.

The metals which are usually involved in these processes are iron, copper, silver, gold, lead, zinc, tin, mercury, antimony, bismuth, nickel, cobalt, platinum, etc. The particular method utilized to extract a metal from its ore varies according to the properties of the metal and the manner in which it is combined with other substances in the ore.

Probably more effort is expended on the extraction of the metal from iron ore than any other, and consequently the practice of metallurgy is applied to that one product more than to any other, because of the tremendous tonnage output. Iron, together with its admixtures of impurities, affords the base for many products and when further refined into various kinds of steel is utilized in innumerable articles. *See also* ELECTRO-METALLURGY.

METAL MOLDING is the art of reproducing in metal any given design; a pattern is first formed and from it a mold is made, thus leaving in the mold a hollow replica of the pattern; subsequently the mold is filled with molten metal and allowed to solidify. The resulting product is a casting and is a copy in metal of the design or model employed.

In a broad sense, any material may be used to make the mold, providing it is capable of retaining the pattern imprint until the metal has solidified. Practically, another metal or various kinds of sands give best results, the kind of metal or sand being dependent upon the molten metal or the intricacies of the pattern. Pattern material offers a wide choice, another metal or wood being most practical. Molding is economical in producing quantities of like metal parts. *See also* CASTING. E. W. C.

***METALS** have been of fundamental importance throughout the civilized period of history.* Two metals, iron and copper, have so molded the characteristics of human industry that history since the stone age is divided into two divisions, called the "bronze age" and the "iron age." At present we are still living in a subdivision of the iron age, the steel age. Copper was probably the first metal used, before bronze, its alloy with tin was made. Both were soon displaced when the commoner, and harder metal, iron, was discovered. As a result of this early employment of metals, the mining and metallurgical industries were among the first developed, and graves of six thousand years ago yield copper tools, and relics of gold, silver, and lead.

In the Dark and Middle Ages, ALCHEMY classed metals as noble or base, founding the distinction on the great brilliance, malleability and freedom from tarnish of the most noble metal, gold. Silver was next in order, and the baser metals were arranged in the order of their resemblance to gold on the bases above mentioned. Platinum, now considered a noble metal, was then unknown. These metals to-day are referred to as precious metals because of their rarity. This characteristic has caused gold and silver to be highly valued since ancient times as means of exchange and personal adornment. Platinum, the most valuable of all, is highly popular for jewelry and is used industrially as well. Because it is unattacked by most chemicals, many utensils for chemical laboratories are made of it.

In recent times a different classification has come into being because of the tremendous rôle played by iron in modern industry, and for mining and metallurgical purposes the metals are divided into ferrous, or iron, and non-ferrous, or not-iron. The former is predominant in the industrial development of this age, followed closely by copper. Modern buildings, machinery, tools, communication and transportation depend on iron for the steel they require. Copper is of vital importance in the generation, transmission and use of electric power. Aluminum and its alloys are coming into use in this field, and in the manufacture of light weight household utensils. Lead and zinc are next in importance, while others produced in lesser quantities, such as nickel, chromium, and manganese are highly significant chiefly for their use in various alloys, particularly in special steels.

Gold and platinum, because they combine with other elements so rarely, are usually found "native," or in the metallic state. Quartz veins and PLACERS are very important sources of gold, while platinum comes mostly from basic IGNEOUS ROCKS and placers. Silver is found "native" occasionally, but more often with copper, arsenic and antimony in combination with sulphur. It is often associated with ores of other metals, principally lead. Because of the ease with which the base metals combine, they are rarely found "native," although an exception must be noted for copper which is found in this state around Lake Superior and in Africa. Most of the base metals ores

are either oxides, as of iron and aluminum, or sulphides, as of copper, lead, and zinc.

In the production of iron, copper, zinc, and lead, the United States leads the world, while for silver it ranks second. Mexico is the largest silver producer, Russia produces the most platinum, and South Africa has far and away the largest production of gold, with Canada and the United States practically even in second place. *See also* ORE; ORE DEPOSITS; METALS, NATIVE; MINING, METAL. S. F. K.

BIBLIOGRAPHY.—C. K. Leith, *World Minerals and World Politics,* 1931; *Economic Aspects of Geology,* 1921; J. E. Spurr, *Political and Commercial Geology,* 1920.

METALS, LIGHT, are those 11 metallic elements with a specific gravity under 3.8. They are concentrated in the first three groups of the PERIODIC SYSTEM OF CHEMICAL ELEMENTS as follows:

Group	*Type of Metal*	*Metals in Group*
1	Alkali	Lithium, Sodium, Potassium, Rubidium and Caesium
	Alkaline Earth	Calcium, Strontium and Barium
	Related to the Alkaline Earths	Magnesium and Beryllium
	Earth	Aluminum

The light metals never occur in the native state but only in the form of chemically stable oxides and salts; as such they are both abundant and widely distributed. They constitute approximately 19% of the earth's crust, the remainder being 6% heavy-metal and 75% non-metallic elements. Due to the large amount of energy required to decompose these compounds, the light metals are the products of the last 125 years, in contrast to many of the heavy metals that have been known for thousands of years. They are usually made by the electrolysis of the fused oxide or haloid salts; magnesium, aluminum, calcium, and sodium now being manufactured on a commercial basis.

The chemical properties likewise differentiate the light from the heavy metals. Among the light metals themselves, most of these properties change progressively from the alkali to the earth groups. The alkali metals are so active that they decompose water, react with most gases, acid, alkalis, and salts and rapidly oxidize in the air. Magnesium, aluminum, and beryllium, on the other hand, are sufficiently stable to be classed as engineering metals. The light metals are electropositive (alkali metals being the most so) to the heavy metals and, therefore, replace them from aqueous solutions of their salts.

The commercial uses of most of the light metals are governed as much by their chemical as by their physical and mechanical properties. The uses may be divided into three general classes; (1) those dependent on their chemical activity, particularly their affinity for oxygen, (2) alloying ingredients for other metals, and (3) materials of construction. Metallic caesium and rubidium have no commercial uses. Beryllium aspires to use as a material of construction but because of its high cost, its uses are very limited.

HISTORICAL DEVELOPMENT OF ALUMINUM AND MAGNESIUM INDUSTRIES

Aluminum

1807 Davy unsuccessfully attempted to electrolyze aluminum oxide and potassium hydroxide.
1825 Örsted reduced aluminum chloride with potassium amalgam.
1827 Wohler reduced aluminum chloride with potassium.
1854 Bunsen and Deville electrolyzed aluminum chloride and sodium chloride.
1854 Deville reduced aluminum chloride with sodium (commercial process).
1855 Aluminum bars were publicly displayed at Paris.
1886 Hall electrolyzed aluminum in cryolite.
Commercial production began in United States.

Magnesium

1808 Davy made a magnesium amalgam.
1830 Bussy reduced magnesium chloride with potassium.
1852 Bunsen electrolyzed magnesium chloride.
1863 Deville and Caron reduced magnesium chloride with sodium (commercial process).
1910 Magnesium was publicly displayed in Germany.
1915 Commercial production began in United States.

See also ALUMINUM; MAGNESIUM. J. A. G.

BIBLIOGRAPHY.—Bureau of Standards circular, *Light Metals and Alloys.*

METALS, NATIVE. Metals are not ordinarily found in an uncombined state in nature, the largest mining production coming from compounds. The most commonly found native metal is gold, as nuggets and grains, in stream beds and quartz veins. Silver is also found in the metallic state, usually associated with silver compounds, as at Cobalt, Canada. Native copper is mined on the Keweenaw Peninsula in upper Michigan. Globules of mercury occasionally are found in cinnabar deposits. Platinum is found in grains in certain igneous rocks, and in stream beds. Native iron is rare except in meteorites. *See also* ORE DEPOSITS; METEORITES; ORE.

METALS, PICKLING OF. *See* PICKLING OF METALS.

METAL SAWING was originally confined to the HACK SAW, a thin strip of steel with teeth cut on one edge and held in a frame to keep it taut. Metal cutting BAND SAWS are now made, and metal is also cut by circular saws, both with solid and with inserted teeth, and in certain cases, without teeth. *See* METAL CUTTING. The cutting of thin metal by thin circular saws is usually called "slitting." F. H. C.

METAL SHEETING. *See* GALVANIZED SHEETS; IRON AND STEEL SHEETS.

METAL WORK, decorative work in metal. All ordinary metals may be used in artistic ornamentation. Iron is especially good in architectural uses, in connection with doors, grills, lanterns, railings, gates and the like, lending itself to graceful tracery. Iron has been used very beautifully in many instances in modernistic decoration and furniture. Fine examples of doors and screens may be seen in the decorative department of the Metropolitan Museum. Almost all the trim and ornamental work in the Chrysler and Empire State buildings is done in metal where formerly wood or stone would have been used. Bronze,

an alloy of copper and tin, and brass, an alloy of copper and zinc, have been used from prehistoric times for wonderfully decorated weapons, doors, statuettes and other objects of art. The pierced brass work of India is world famous. Domestic utensils now made of tinplate or silverplate were formerly of copper, brass or pewter. The latter made beautiful tableware. In the time of Louis XIV gilt bronze, *ormolu,* was used extensively for clocks, vases, mirror frames, chandeliers, and other pieces.

A primitive process of forging iron and decorating it by hammering was known among uncivilized peoples. The ancient Chinese bronze and brass vases, bowls and other objects were so exquisite in workmanship that they come under the classification of the fine arts. Many of the choicest examples date from the Chou Dynasty (1125-255 B.C.). East Indian copper, bronze, and brass articles, vessels for both domestic and sacred use have been made since early times and are elaborately patterned by damascening, enameling and *cire perdue* processes. Chariots of the Greeks and Romans were covered with ornamental bronze and copper plates. As examples of REPOUSSÉ, the bronzes of Siris, now in the British Museum, dating from the 4th century B.C. have never been equaled. The Middle Ages was the great period of metal work, particularly in connection with Gothic art and architecture. The bronze doors of the baptistry at Florence executed by GHIBERTI and Pisano in the 15th century represent the height of architectural metal working in Europe. The arms and armour of Middle Ages were often elaborately decorated in the process of founding and also beautifully chased, embossed and encrusted with precious metals. Enameling in its various forms comes first among the processes of decorating metal by applying other substances to its surface. (*See* ENAMEL.) This art originated in western Asia and is excelled in by the Chinese and Japanese, and among western peoples by the French.

METAL WORKING usually includes all operations performed on metal whether it be FORGING, cold working or cutting by tool or torch. Some, however, make a distinction between working metal by hot or cold forming processes and by cutting, and in some cases the term is reserved for sheet or plate metal work. Up to and including a thickness of 0.2145 in. flat metal is called a "sheet;" above that thickness it is known as a "plate." Machines for working metal sheets and plates differ widely from those used in cutting metal bars or castings; many intricate shapes are made by forming the sheet metal between DIES, as, e.g., automobile fenders and body parts, cooking utensils, cigarette boxes and the like. For details of these operations *see* MACHINE SHOP PRACTICE; METAL CUTTING; MACHINE TOOLS; PRESSES AND PRESS WORK; PUNCHING AND SHEARING MACHINES.

METAMORPHIC ROCKS, produced by the METAMORPHISM of preexisting SEDIMENTARY and IGNEOUS ROCKS. Great heat, pressure and circulating vapors or solutions may change these latter rocks profoundly, through the introduction of new compounds, the modification of the chemical composition or crystal systems of constituent minerals, and reorienting crystals in conformity with strains set up in the rocks. GNEISSES, SCHISTS, SLATES, MARBLES and QUARTZITES are typical metamorphic rocks thus produced. *See also* PETROLOGY; GEOLOGY.

METAMORPHISM, the geological processes whereby rocks are often altered, sometimes beyond recognition of their original nature. Strictly speaking, WEATHERING and EROSION are metamorphic agents, but the term is ordinarily limited to processes of densification, recrystallization and changes in mineral composition which take place at some depth within the earth.

Mechanical movements and pressure, liquids and gases, and heat are the three principal agents of metamorphism. In altering rocks movements in the earth's crust are more effective than the static pressure of overlying material. Under the shearing stresses thus set up, minerals tend to reorient themselves with their long axes perpendicular to the direction of pressure, producing the foliated structure seen in SCHISTS and GNEISSES. Although the chemical composition is not changed, the mineralogical one may be, as when a PYROXENE rock alters to a HORNBLENDE schist. The heat generated by compression, and any circulating hot waters, materially aid the process. When it takes place over a wide area, metamorphosing great masses of rock, it is spoken of as regional or general metamorphism.

Contact or local metamorphism is produced by the intrusion of a molten MAGMA into other rocks. Circulating hot waters from the magma, with dissolved gases and minerals, alter the chemical and mineral composition of the near-by rocks, often introducing new compounds. Thus ORE minerals, both oxides and sulphides, and such silicates as GARNET, EPIDOTE and TOURMALINE may be formed, especially in intruded LIMESTONE. The rocks, particularly CLAYS, near the igneous intrusion are often baked into so-called hornstone or hornfels. These "contact effects" may sometimes extend several miles from the igneous intrusive. Heat, whether from the earth's interior, from earth movements or molten intrusions, promotes the formation of new compounds, recrystallization of old ones, and increases the solvent action of solutions in both contact and regional metamorphism. SEDIMENTARY, IGNEOUS and METAMORPHIC ROCKS are subject to metamorphism but the dense, siliceous character of igneous and metamorphic rocks enables them to resist the process better than sedimentary ones. *See also* GEOLOGY; MARBLE; ORE DEPOSITS; SLATE; PETROLOGY; VULCANISM. S. F. K.

BIBLIOGRAPHY.—C. K. Leith and W. J. Mead, *Metamorphic Geology,* 1915.

METAMORPHOSIS, in zoology, a term signifying *transformation,* or changes of form after hatching. It is a kind of indirect development that is familiar in the change of a tadpole into a frog. Metamorphosis is best developed in insects, wherein two principal types occur: *Complete,* with distinct larval,

pupal, and adult stages; and *Incomplete,* with only larval (or nymphal) and adult stages, no pupal stage intervening between them. In the former the larva is more or less worm-like, and lacks visible wing buds. In the latter, the larva (*nymph* or *naiad*) differs less from the adult and has wing buds visibly developing upon the back. Complete metamorphosis is found in the largest orders of insects, especially the big four: Coleoptera, Lepidoptera, Diptera, and Hymenoptera. It signifies the breaking up of the life cycle into two periods of activity corresponding to the two major activities of life: a period of feeding and growth, and a period of reproduction. Between the two stands the pupa, as an intermediary stage for the making over of the one into the other.

METAPHOR, identification of one object or action with another of quite a different class, e.g., referring to a much-valued possession as "the apple of one's eye." Metaphor is the commonest of all figures of speech. It is more forceful than the SIMILE, which merely indicates the resemblance between two things, whereas the metaphor completely identifies them for the time being. It adds to the force and emotional effect, rather than to the clarity, of the idea, and is particularly used to give concreteness to abstract ideas; in fact, many metaphors—"a broken heart," for instance—have become the natural way of expressing an abstract concept. Metaphors can, however, be forced and far-fetched, and sometimes crowd upon one another so fast that incompatible ideas are brought together, with the resultant confusion of the "mixed metaphor," as "to take up arms against a sea of troubles." K. D. S.

BIBLIOGRAPHY.—A. Bain, *English Composition and Rhetoric,* 1872; A. S. Hill, *The Principles of Rhetoric,* 1895.

METAPHYSICS is philosophy inspired largely by that impulse of wonder to which ARISTOTLE attributed all disinterested human knowledge. It is a looking into meanings and possibilities that lie far beyond the familiar world of custom and use. It is a search for the final truth or reality behind the appearances with which man is never satisfied. It is a quest for the really fundamental ideas concerning life and existence. The mind in its wondering, metaphysical vein is not content until it has attained clear and consistent ideas and a thoroughly comprehensive grasp of the truth. Hence metaphysics involves a logical study of common notions, a new definition of the ideas that are essential and fruitful and lastly, a reconstruction of belief in terms of these new ideas and in accordance with reason. A metaphysics thus becomes a complete theory of reality and the universe.

Since metaphysics is a supreme form of theorizing, there can be a metaphysics of any subject of fundamental and enduring interest to the inquiring mind. An inquiry into the world of physical science will become a metaphysics of nature, or COSMOLOGY; one into the possibility of man's knowledge, an EPISTEMOLOGY; one into the significance of moral conduct, a metaphysics of morals; and so on for politics, society, art, religion. All varieties of metaphysics have this in common, however, that they purport to give the essentials of reality in this or that particular aspect, and consequently, they are all, in some degree or other, a metaphysics of essence or being, or in technical language, ONTOLOGY.

The original meaning came from Aristotle's inquiries about substance, cause, motion, change and being, in the course of which he developed a theory of form and matter extending to the whole of nature. These speculations about nature were placed, in the collection of Aristotle's works, after the physics, and so they were called that in the Greek, *meta physica.* Thereafter any search for ultimate and universal principles was called metaphysics. Another usage arose in the Middle Ages. The schoolmen, as they were called, wondered about the meaning of their religion and the relation of God to man and to the world which was believed to be His Divine Creation. THOMAS AQUINAS was inspired by the rediscovery of Aristotle to emulate the Greek metaphysics with a summation of Christian views concerning not merely nature but the Being above nature revealed to man through Christ. This was, in effect, a metaphysics of supernature. After scholasticism, then, metaphysics was thought of as concerned with transcendent reality, above and beyond anything the natural sciences can reach.

Modern Metaphysics. The great age of modern metaphysics, the 17th century, also made its contribution to the traditional meaning. An almost religious enthusiasm had arisen for mathematical science which seemed capable of explaining all things by means of the concepts of matter and motion. Descartes's (*see* DESCARTES, RENÉ) dream of universal mechanism was characteristic of the new aspirations. Yet the medieval belief in the realm of spirit still held sway, and the result was that the modern thinkers were set wondering about the relation of spirit and matter. They sought to understand this duality and get the ultimate *rationale* of it. Some turned to matter as the real principle, others to spirit; still others pressed on to the conception of an infinite substance or else a system of individual substances having both the mental and the bodily nature. The names of THOMAS HOBBES, Malebranche, BARUCH SPINOZA, GOTTFRIED LEIBNITZ are associated with this rationalistic speculation. And metaphysics has tended to be identified ever since, with such purely abstract reasoning.

In the 18th century metaphysics acquired a negative meaning. The preoccupation of the day with the experimental method in science led to a disparagement of abstract thought and its pretences to a truth superior to science. The philosophers JOHN LOCKE, GEORGE BERKELEY and DAVID HUME criticized the age-old ideas such as substance, cause, infinity. This criticism reached its apogee in Kant's (*see* KANT, IMMANUEL) *Critique of Pure Reason* which vindicated science against the rationalistic metaphysics. The work of Kant gave rise, however, to a new and constructive metaphysics. His thorough critique of knowledge led him to an analysis of the fundamentals of truth, that is, to an Epistemology. Although this involved a

denial of knowledge about ultimate reality, it proved that science can achieve truth in the realm of human experience. Furthermore Kant marveled at the fact of moral duty, and perceived something ultimate in it, which he set forth in a metaphysics of morals. But this was not enough for his successors. GEORG HEGEL, especially, wondered at that absolute separation of appearance and reality, reluctant to believe that reason which ever seeks the ultimate and real would pronounce thus against the attainment of its own goal. The outcome was another metaphysics of reality supplementing those of knowledge and morality, an idealistic view of the world of appearances as a system revealing the Absolute. Since the 19th century it is a common expectation that a metaphysics will describe a system where all is rational.

Contemporary Philosophy. In contemporary philosophy the prevailing empirical attitude, derived from natural science, is opposed to such system-making and speculation. Yet wonder cannot be kept out of thought. The mind will persist in seeking the most comprehensive view possible of its world, so that even those who profess to accept nothing but the positive results of the sciences tend to put them all together in some system like the positivism of AUGUSTE COMTE. Moreover the sciences themselves implicitly assume some kind of Cosmology, and when they are brought, by discoveries within their own fields, to make an examination of their fundamental concepts, as is the case to-day with regard to space, time, motion, matter, energy and cause, they perforce become metaphysical. And it is to be expected that metaphysics is necessary for science as well as life, for where there is no theorizing beyond what is familiar and accepted, there is no wisdom. C. W. HE.

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METAPSYCHICS, a term proposed by Richet to refer to phenomena that fall beyond the range of accredited science, including psychology, physiology and physics. He includes CRYPTAESTHESIA, or the power to perceive at a distance or through obstacles transcending the recognized mode of action of the senses; TELEKINESIS, or the power to exert energy and move bodies without mechanical connection; and ECTOPLASM, which is the creation of living tissue in a supernormal manner. The term then extends to all occult or transcendent phenomena and becomes nothing less than a challenge to science, positing another order of forces than those operating in the everyday world. It is a bold inclusive hypothesis, finding followers only among those committed to a belief in the supernormal. Richet does not accept the spiritistic explanation. With few exceptions, the hypothesis is regarded by men of science as based on wofully defective evidence; it is gratuitously extravagant. Others, Flournoy among them, prefer the term PARAPSYCHOLOGY to indicate mediumistic phenomena or the many forms of unscientific beliefs in occult forces and systems.

METASTASIO (1698-1782), Italian dramatist, was born at Rome, Jan. 13, 1698. His real name was Pietro Trapassi, but the noted lawyer Gravina adopted him and changed it to Metastasio, symbolizing his altered life. Metastasio's precocity aroused universal wonder. After Gravina's death, 1718, he won the patronage of La Romanina, Roman prima donna. At her house he met the composers who later put his dramas to music. These musical dramas, performed in the chief towns of Italy, achieved extraordinary popularity, notwithstanding the conventionality of plot and the paucity of linguistic range. In 1730, the playwright settled at Vienna as imperial poet. He earned a European reputation with such plays as *Didone Abbandonata, Catone in Utica* and *Siroe.*

The popularity of Metastasio's plays continued undiminished for many years, and Italian folksongs still preserve some of his melodies. He died at Vienna, Apr. 12, 1782.

METATHESIS, a type of chemical reaction consisting of a simple interchange of ions or atoms. A metathetic reaction may be defined by the general chemical equation: $AB + CD \rightarrow AD + CB$. The term is also applied to substitutions such as that by which a metal displaces hydrogen from an acid, but these are better characterized as oxidation-reduction reactions. *See* OXIDATION AND REDUCTION; REACTION, CHEMICAL.

METAURUS, a river of ancient Umbria in Italy, now the Metaro. Its source was in the heights of the Apennine Mountains, from which it flowed for a distance of 50 mi. into the Adriatic Sea. Along its steep banks was built the Flaminian Way. The Metaurus is famous in history for having been the seat of battle that caused the turning point in the Second Punic War. It was in attempting to cross this stream that Hasdrubal, the brother of Hannibal, was overtaken by the Romans and his forces put to route, 207 B.C. Hasdrubal himself was slain and his head thrown into his brother's camp.

METAYAGE SYSTEM, a system of farming under which a person contracts with a landowner to cultivate his soil for a certain period of time and to receive as compensation for his labor a certain part of the produce. The terms of such contracts vary according to the practices prevailing in different localities and according to the fertility of the land. The landowner may furnish a part, all or none of the equipment, stock or seed and he receives a portion of the produce, the exact percentage depending upon the terms of the agreement. Ordinarily, the landowner pays the taxes on the land and maintains, in good order, the buildings, fences and permanent equipment. This system of farming is common in the United States, France, Italy, Portugal and other European countries. In the United States the metayage system is popularly termed renting on the shares.

METCHNIKOFF, ELIE (ILYA) (1845-1916), Russian scientist and French citizen, was born in

Kharkoff, Russia, May 15, 1845. Educated in Germany, he taught zoölogy and bacteriology at Odessa from 1870 to 1882. Travel and study through the northern steppes resulted in his pioneer work on the intercellular digestion of invertebrates, which proved that certain cells attack harmful bacteria entering an organism. These "scavenger" cells he named phagocytes; PHAGOCYTOSIS in turn led to vaccine therapy. Moving to Paris in 1890, Metchnikoff became associated with the Pasteur Institute, and later became director. Then began his famous investigations into intestinal flora and lactic ferments. *See* FERMENTATION. Studies of the higher animals and of typhoid followed. Metchnikoff published many scientific and popular works, among them *Pathology of Inflammation, Nature of Man, Immunity in Infectious Diseases, Prolongation of Life.* In 1908, he shared the Nobel prize for medicine with Paul Ehrlich. Metchnikoff died in Paris, July 15, 1916.

METEMPSYCHOSIS, the transmigration of souls. The belief in metempsychosis was one of the earliest expressions of the doctrine of IMMORTALITY. It is still held quite extensively. It may take the form of the rebirth of the soul in some other individual, or that of its translation into some other animal. The belief in the transmigration of souls was held by the early Egyptians and was also a part of the Pythagorean mystical cult. The Hindu doctrine of rebirths is a phase of metempsychosis. The Jewish Cabbala and the Shiite sect of the Moslems have also given expression to it. Christianity, with its day of judgment, has had little use for metempsychosis.

METEOR CRATER, a large circular depression with steep, high walls in Arizona, near Cañon Diablo, believed to be due to the fall of a single large METEORITE or of a swarm of small ones.

METEORITE, the larger specimens among METEORS, which survive their passage through the earth's atmosphere without burning up, and reach the ground intact. They are divided into three classes: siderites, which are composed of practically pure iron and nickel; aerolites, composed of rocky material, and siderolites, which are a mixture of both. The largest siderite now known is that at Grootfontein, South West Africa, weighing at least 50 tons.

METEOROLOGY. The name meteorology as applied to the science treating with atmospheric phenomena is derived from the Greek. No exact date of origin of the science can be set; but we know from the writings of Greek philosophers that from very early times peoples elicited an interest in the behavior of the air about them, that is, in the weather. Probably the best of the early treatises on meteorology was that of the Greek philosopher, Aristotle (born 384 B.C.), namely, his *Meteorologica.*

Formal research in the field of meteorology since the early 19th century has elevated the subject to the status of a physical science. The science may be divided into two phases, namely, theoretical and applied. The applied aspects are far more appealing than the theoretical, but without the development of theory, little progress could have been made in the applied field.

Theoretical Meteorology. In this field, consideration is given to an exact determination of the nature of and reason for mechanical movements of the air. The effects of varying temperatures, of solar and other possible extra-terrestrial influences, revolution and rotation of the earth, inclination of the earth's axis and the composition of the air itself are investigated. Numerous critical discoveries have been made concerning the atmosphere without which the development of the science of meteorology would have been greatly retarded. Probably the most important early discovery was the fact that air has weight and hence exerts pressure. In 1643 Torricelli, living in Florence, devised a method for measuring this pressure. His experiment has been repeated thousands of times since his day. Torricelli's tube, as his device was known, was nothing but a simplified form of our modern mercurial barometer; but it was revolutionary, for much of man's subsequent knowledge of atmospherics has grown out of the fundamental concept that air has weight and exerts pressure.

There followed in fairly rapid succession, discoveries of ways and means for measuring other atmospheric phenomena such as the ratio between temperature changes and the amount of expansion or contraction of the air, the rate of decrease of pressure with increasing altitude, the chemical composition of the air, wind velocity, and height of the atmosphere. Associated with these early studies are such illustrious scientists as Boyle, Galileo, Pascal, and Gay-Lussac. Since the 16th and 17th centuries, when many of these early studies were made, numerous refinements have evolved. The fields of physics, chemistry, astronomy and mathematics have laid the foundation upon which meteorology has been built. The names of Abbott, Marvin, Shaw, Bjerknes, Hann, Hellmann, Rotch, Humphreys, Chamberlin, Millikan, and many more, call up in the minds of those closely associated with meteorological investigations, the intricate ramifications of the subject and the long list of problems yet remaining unsolved.

Since 1900 efforts to learn more about the behavior of the atmosphere and particularly about weather variability have led to researches upon the sun and in stellar space. Possible relations to sun spot periodicity and to variations in the amount of solar radiation have been postulated, but as yet no positive conclusions have been arrived at with respect to the exact measurement of the influence of the extra-terrestrial phenomena upon our weather. Progress has been made to the extent of practice in long-range weather forecasts based upon solar radiation. While some men, as Dr. C. G. Abbott of the Smithsonian Institution, are convinced that long-range forecasts must be related to the solar constant, others oppose the viewpoint and insist that such forecasts will have to await findings revealing the relationship between the behavior of the atmosphere in polar latitudes and that in equatorial regions.

There is reason to believe that the precision with which men calculate the orbits of stellar bodies, the location of heretofore unseen planets, the velocity of light, the behavior of cosmic rays and many other natural phenomena, indicates an orderliness in nature applicable to the mechanics of the atmosphere. Hence, investigations in theoretical meteorology continue with the well-founded hope that we shall eventually come to understand the present mysteries of the air.

Applied Meteorology. The ultimate objective of theoretical meteorology, as already hinted, is its application in a manner which will accrue to the benefit of man. The major good is likely to come from accurate weather forecasting. Man has ever been interested in knowing what the morrow will bring in all life's adventures, and his curiosity concerning the future weather has always fascinated him. Accordingly, since weather forecasting is the ultimate objective of meteorology, a somewhat detailed account of the present forecast methods is of especial interest.

Every morning, at 8 A.M. Eastern Standard time, atmospheric observations are made at some 200 or more weather bureau stations throughout the United States and these in turn are telegraphed to certain stations where the making of a weather map is authorized. On it are recorded the maximum and minimum temperatures, the relative humidity, the air pressure, wind velocity and direction, percentage of cloudiness, amount of precipitation and kind, and such special phenomena as thunderstorms, hail, and winds of gale force.

After the data are recorded, two major sets of lines are drawn, namely isotherms and isobars, the former being lines passing through all points with the same temperature and the latter lines connecting all points with equal pressure.

Often auxiliary maps are charted to show temperature and pressure changes during the preceding 12 or 24 hours.

The most significant data on the map consist of the barometer readings and the resultant series of isobars. The latter form more or less concentric circles, ellipses or loops which represent what are technically known as storm areas. In this sense storm does not refer to kind of weather. Experience shows that these areas move across the country and about the earth, in the Northern Hemisphere, in a general easterly direction. While few make the complete circuit of the earth, so far as we know, many of them may travel half way or more round the earth. In general, we know that whatever atmospheric conditions characterize these pressure areas at a given location, they are likely to be transmitted exactly or in modified form to other regions as they migrate. Local topographic conditions, varying distribution of water bodies, and changes in latitude introduce modifications. These storms move at the rate of 20 to 30 mi. an hour. However, oftentimes they move much more slowly and again more rapidly. Experience enables one to estimate their probable rate of movement. Some meteorologists have worked out mathematical formulæ for determining this rate, but such formulæ are not yet absolutely dependable. The weather forecast for any locality is based upon the probability of translation, within a given period of time, of the weather as expressed by these storm areas, from a point west of the observer to the position of the observer. However, the forecast in actuality is not so simple.

The concentric arrangements on the map are known respectively as high and low pressure areas, or technically as anticyclones and cyclones, respectively. In the anticyclone the air moves spirally downward and outward from the center, while in a cyclone it moves spirally inward and upward toward the center. This is the circulation in the Northern Hemisphere as affected by the rotation of the earth. In general, winds in this hemisphere are deflected toward the right and in the Southern Hemisphere toward the left, a phenomenon emphasized by William Ferrel in 1859. In consequence of this circulation the weather in highs tends to be clearing and in lows cloudy. Usually precipitation occurs in association with the latter areas although it is not unknown in the former. These characteristics, with their many variations and deviations from the expected, complicate forecasting. Bjerknes, the Norwegian meteorologist, has advanced a "polar front" theory relative to the circulation of air in cyclones, which however, is still incomplete and too involved for presentation here.

The paths followed by these storms are in no sense fixed. There is a tendency for them to follow in general, certain courses at different times of the year, but not infrequently, a storm expected to travel along a given path moves otherwise and causes a failure in the forecast. Theoretical meteorology, it is hoped, will unfold the secret back of these surprise movements and place our forecasts, in this respect at least, upon a more scientific basis.

Thus far we have not mentioned the general circulation of the atmosphere, which in turn no doubt affects the passing highs and lows and also our weather variations. These storm areas are located mainly in the zone or belt of prevailing westerly winds, a belt confined approximately between the latitudes of 35° N. and 66½° S. Within these areas, the upper air drifts from west to east. Locally, the highs and lows induce winds from other directions. It is not uncommon for some cities in the westerly wind belt to experience prevailing winds from the southeast or northeast. Within the westerly belt are great permanent and semi-permanent highs and lows which seem to affect the movements of the secondary or unstable smaller highs and lows already described. Space limitations do not allow of a discussion of the complexities introduced into forecasting by these features.

In the Northern Hemisphere, south of the westerlies, is a belt of descending air covering about two degrees of latitude, known as the horse latitudes; adjacent to this belt on the south, are the northeast

trade winds and still beyond, in equatorial latitudes, are the doldrums or calms. In the Southern Hemisphere, a corresponding system occurs except that the trade winds blow from the southeast.

This entire planetary circulation shifts during the year with the shifting position of the earth in its revolution about the sun. Then too, it seems to be influenced by slight variations in solar radiation as previously cited. Variations in weather conditions over long periods of time, such as 11, 21 and 35 year cycles yet remain to be explained.

From the foregoing discussion, it must be evident to the reader that while progress has been made in meteorological science, much awaits accomplishment. Nevertheless, it should be borne in mind that the science is comparatively young when viewed from the standpoint of the necessary widespread observations essential to a mere knowledge of how the atmosphere behaves. This information could not be obtained until the earth became well-settled. There still are unoccupied areas from which data are needed. The most recent heroic work has been the establishment of observation stations on Greenland by investigators from the United States, Denmark, and Norway, in the hope that we might learn something of the relation of arctic atmospheric circulation to the world's weather. Then too, sea temperature observations are now being regularly made by recording thermometers, that is, sea thermographs, in the hope that a knowledge of the characteristics and behavior of ocean currents will assist in the interpretation of atmospheric movements. Many governments are cooperating in making observations, exchanging them and compiling data to the end that all mankind may be benefitted by increasingly accurate knowledge of the behavior of the atmosphere. E. Van C.

METEORS, streaks of light that may be seen darting across the sky on almost any night. They are popularly but erroneously called shooting stars. Meteors are very small bodies, usually not larger than peas, that approach the earth from space with high velocities, 20 miles a second or more; become very hot through the friction they encounter in the earth's atmosphere, and usually burn up in a few seconds. Those that are large enough to reach the ground before they are completely burned up are called Meteorites.

Meteors come from all parts of space, from the planetary system as well as from outside, as can be proved from the direct observation of their speeds. If a meteor is a permanent member of the solar system it cannot have a speed greater than 26 miles a second when it enters the earth's atmosphere. If its speed is greater than this limiting value, which constitutes the Velocity of Escape at that point, it must come from outside. Some speeds as high as 45 miles per second have been observed. Many meteors are members of swarms that follow regular paths around the sun. These paths intersect the path of the earth at the same time each year. The Perseids or August meteors, and the Leonids or November meteors are the most prominent of these. Other swarms follow in the wake of comets with which they are intimately connected. One case is known where a comet, that of Biela, pretty certainly disintegrated into a swarm of meteors, the Andromedids.

From direct observations it has been estimated that meteors first become visible at an average height of 80 miles in the earth's atmosphere, and travel a distance of some 40 miles before they are consumed by their own heat. The total number of meteors falling on the earth is enormous, and may well exceed 10 million a day. Their total mass, in tons, is large; but compared to the great mass of the earth this daily addition is insignificant. W. J. L.

METER, WATER. *See* Water Meter.

METERS, ELECTRIC. Most of the devices commonly referred to as electric meters are really indicating instruments and do not measure quantity. In the class of true meters are the watt-hour meter and the ampere-hour meter. These measure, respectively, the amounts of electric energy and electric charge which pass through them. Watt-hour meters have been highly refined, for upon them the electric power industry must depend for the accurate measurement of the product it sells. The ampere-hour meter is used principally as an aid to the proper maintenance of electric storage batteries. By means of it, the amount of electric charge delivered to or from a storage battery is conveniently measured.

The most common of the indicating instruments are the Voltmeter and Ammeter, which indicate the magnitude of the potential and current, respectively, of a circuit. *See also* Instruments, Electric.

METERS, GAS. *See* Gas Meters.

METHANE, a colorless, odorless gas (CH_4), occurring naturally as Marsh Gas and fire damp. It is a product of the destructive distillation of coal, wood, etc. Methane is slightly soluble in water and condenses to a colorless liquid at —160° C. Its specific gravity is 0.559. *See also* Aliphatic Compounds.

METHANOL, or **METHYL ALCOHOL,** also known as wood alcohol or Columbian Spirits. It is a colorless liquid, formula CH_3OH, of 0.797 sp. gr., boiling at 64.7° C., freezing at —97.8° C., and mixing with water in all proportions. Methanol is an excellent solvent for many substances, it burns with a pale blue flame which does not deposit soot. It reacts with many substances, forms Esters with acids and a methylate with sodium.

The major uses of methanol are as in Anti-freeze Substances in automobile radiators (for which purpose 1 gallon is equal to 1⅓ gallons of grain alcohol), as a raw material for Formaldehyde manufacture, and as a Solvent. It is also used to make dimethylaniline, dimethyl sulphate, methyl salicylate (oil of wintergreen), and other chemicals.

Methanol is poisonous if taken internally. It is capable of producing intoxication, at first similar to that by ethyl alcohol, but, due to the fact that it is oxidized to poisonous products in the body, such as formaldehyde or formic acid, it is extremely poisonous,

often causing blindness or death. Because of its poisonous property, it is not used in medicine or pharmacy. For injurious effects of breathing methanol vapors, *see* GASES AND ATMOSPHERES, INJURIOUS.

Production. In 1930, more than half of the production of 12,000,000 gallons was made by synthetic methods from hydrogen and carbon monoxide or carbon dioxide, passed over a catalyst under proper conditions of temperature and pressure (*see also* PRESSURE REACTION IN INDUSTRIAL CHEMISTRY). The carbon monoxide is usually obtained as a by-product from hydrogen manufacturing processes. The hydrogen can be made by any one of the methods discussed under NITROGEN FIXATION. The crude methanol is distilled to remove other alcohols, and is then redistilled to bring it up to 99.5% purity.

Methanol is also produced along with acetate of lime, charcoal and other minor products by the destructive distillation (*see also* WOOD DISTILLATION), in a closed retort, of waste hard woods such as beech, birch, maple, ash, and ironwood. A cord of wood yields from 45 to 50 bushels of charcoal, 150 to 200 pounds of acetate of lime, and 8 to 10 gallons of methanol. The crude methanol must be redistilled to remove acetone and other impurities. *See also* ALCOHOL, INDUSTRIAL. G. A. P.

METHODISM. The genesis of the Methodist movement, out of which the various churches related to that name have grown, is generally traced to a society of undergraduates formed at Oxford University, England, in the closing years of the third decade of the 18th century. This group, which placed itself under the leadership of JOHN WESLEY, a fellow of Lincoln College, sought to cultivate an ascetic type of piety, combined with a rigorous schedule of religious activities in behalf of the poor and the prisoners of the town. Strict adherence to this régime earned for the group the name of Methodists, bestowed in derision by other undergraduates, and this name later adhered to the followers gathered by Wesley in his wider evangelistic career.

Appearance as Distinct Religious Movement. After six years in residence as an Oxford don, John Wesley joined one of Oglethorpe's early expeditions to Georgia, where he became rector of the Anglican parish in Savannah, with responsibility for the spiritual welfare of other settlements in the new colony. His venture in the New World, however, proved disappointing, his extreme high churchmanship and personal asceticism alike rendering him unacceptable to the members of such a primitive community. Wesley accordingly returned to England in 1738. There he at once became absorbed in the pietistic atmosphere of the religious societies which were flourishing in London, some of them as adjuncts of established churches and some as a result of the preaching of Moravian missionaries. It was in one of these religious societies, meeting in Aldersgate St., London, that, on the night of May 24, 1738, Wesley felt his heart "strangely warmed," as he expressed it in his journal. From this date Methodists are accustomed to reckon the appearance of Methodism as a distinct religious movement.

Following the example set by George Whitefield, an Anglican clergyman who had been a member of the Methodist group at Oxford, the aroused Wesley in the following year, 1739, began the field preaching which he was to continue for more than half a century. The records of his labors as an evangelist almost surpass belief. He averaged more than 4,500 miles of travel a year for more than 50 years. There are authentic reports of his delivery of more than 42,000 sermons. More important, however, than the extent of his work was the permanency of the results achieved. The converts who responded to his preaching were enrolled in classes, which met weekly, and these were, in turn, gathered in larger societies. In this way, Methodism in England gathered an enrolled membership of 135,000 before the death of its founder.

In the organization of these Methodist societies John Wesley had the assistance of a number of Anglican clergymen, notably his brother, Charles, who became the great hymn writer of the Methodist movement; Whitefield, who divided his unsurpassed preaching efforts about equally between England and America; Thomas Coke, another Oxford graduate, whose career carried him to Ireland, America and the Orient, and John Fletcher, rector of Madeley, who became the foremost apologist for Methodist doctrine. But the principal evangelistic work of the movement was done by lay preachers, who moved rapidly about under Wesley's orders, thus inaugurating that itinerancy which remains a distinguishing mark of the Methodist system.

Evangelical Aspects. The Wesleyan revival brought no innovations in doctrine, John Wesley always maintaining that he preached only the accepted doctrines of the Church of England, but with emphasis on those evangelical aspects which, in the 18th century, had become largely neglected. In the main, the Methodist preaching concerned itself with man's sinfulness and need of salvation; the provision of this salvation by a loving Father God through the mediation of His Son, Jesus Christ; the believer's consciousness of salvation following acceptance of the divine gift of pardon; the believer's testimony to his salvation by a life of godliness, having entire submission to the will of God as its ultimate goal. Matters of doctrinal detail never concerned Wesley greatly; he sought primarily to change the ways of living of his converts. "If thy heart is as my heart, give me thy hand," was an invitation which he constantly repeated. The Methodists he described as members of societies of earnest persons "having the form and seeking the power of godliness." On the other hand, he strongly supported the Arminian doctrine of free will and opposed the Calvinist teaching of predestination, holding this necessary to belief in the justice and love of God and the moral responsibility of man.

The rapid growth of the Methodist societies in England led to the accumulation of considerable property. As long as he lived, title to this property reposed in

John Wesley; but in 1784 the founder entered a deed in the British Court of Chancery which constituted the annual conference which he had formed the habit of holding with his ministers into a legal and permanent body, and gave to a selected and self-perpetuating group of 100 Methodist ministers, known still as the Legal Hundred, the control of Methodist property in England.

Spread to America. Methodism may, in a sense, be said to have been brought to America when Whitefield made his first preaching tour of the colonies in 1739. It was not until about 1766, however, that meetings conducted by lay preachers who had been members of the Methodist societies in Ireland were held in the New World. The question as to priority has never been finally settled; it seems likely that the first Methodist services in America were those led by Robert Strawbridge in Frederick County, Maryland, followed closely, in point of time, by the formation of a society in New York under the leadership of Philip Embury, in which Mrs. Barbara Heck, later a Methodist pioneer in Canada, and Capt. Thomas Webb, of the British garrison, were the most conspicuous members.

Under the direction of Wesley several preachers were sent out from England to stimulate the growth of Methodist societies in the colonies. But the movement suffered a severe check with the outbreak of the Revolutionary War. The Wesley brothers took a position of aggressive opposition to the cause of American independence. In this they were supported by most of the Methodist itinerant preachers in the colonies, all but one of whom, Francis Asbury, returned to the mother country. Methodists were therefore widely suspected of Tory leanings, and were frequently victims of mob anger. Asbury found it necessary to spend much time, during the war years, in hiding. With the end of the war, however, there followed a speedy and amazing change in the fortunes of American Methodism. The American societies felt it impolitic, if not impossible, to continue under the personal direction of John Wesley. He, therefore, in response to their requests, ordained Thomas Coke to be superintendent and two other English preachers to be elders in a new Methodist church to be formed in the United States, to which was to be given an episcopal form of government. Controversy has never ceased over the validity of these ordinations, which were bitterly opposed at the time by Charles Wesley and by many other Methodist leaders. John Wesley, however, firmly believed that the practice of the primitive church showed no difference between the ordaining powers of presbyters and bishops, and therefore held himself, as a presbyter of the Church of England, justified in "setting apart," to use his own words, the three men specially chosen to labor in the critical situation which admittedly obtained in America.

In the main, the controversy over Wesley's ordinations for America has been beside the point. No question of the validity of orders, in the sacerdotal sense, was involved, or ever has been. The Methodist preachers in the United States, under the leadership of Francis Asbury, while showing every desire to follow the wisdom of their founder, showed likewise their determination to erect their independent church in accordance with their own wishes, growing out of their knowledge of the American situation. During Christmas week, 1784, in a general conference of all the available ministers, held in Baltimore, they accordingly brought into existence by their own votes the Methodist Episcopal Church, with Asbury and Coke elected as superintendents, Asbury being ordained by the three English preachers sent out by Wesley and by the minister of a German congregation in Baltimore, and the two superintendents then ordaining the preachers as elders and deacons. From that day the Methodist ministry in all its branches, from its lay, or local, preachers to its superintendents, now usually called bishops, has been purely a pragmatic arrangement to secure effective church administration.

Government of Church. The government of the Methodist Episcopal Church, which was thus originally lodged in a conference of all the ministers, has since 1808 been under the control of a delegated general conference, meeting quadrennially, in which at present membership is equally divided between clerical and lay members, women being eligible to election as lay delegates. In addition to this general conference, central conferences, also meeting quadrennially, have been established on the principal mission fields, and hold practically autonomous power over the churches in those fields, including the power to elect their bishops.

In the American church, Asbury soon established himself as dominant. As Wesley grew more feeble, Coke gave himself increasingly to the direction of Methodist affairs in Great Britain, and finally faded out of the American picture entirely. Asbury took to the saddle, becoming field marshal of an army of circuit riders who followed the frontiersmen as rapidly as they crossed the Alleghenies and founded their settlements in what had been the wilderness. By the time of Asbury's death, in 1816, he had covered more than 260,000 miles, most of it mere wilderness trail, while preaching and administering; had ordained more than 4,000 preachers; had seen the membership of the Church grow to more than 130,000, and its congregation and conferences established on what was then the nation's farthest frontier in Ohio and Tennessee.

After the death of John Wesley, in 1791, the annual conference in England continued its sessions under presidents elected from its own membership. Until the second or third decade of the 19th century the attempt was continued to maintain the theory that British Wesleyanism was merely a collection of religious societies, but after that time it took its place avowedly among the non-conformist churches of England, providing for the ordination of its ministers and their adoption of clerical titles. The British Wesleyan

Church has developed normally, showing in recent years a remarkable adaptability to church work of an institutional type in the largest cities of England. It has always maintained a close friendship with the Anglican establishment, and is probably nearer, in spirit and practice, to the Church of England than any other British free church. A considerable rigidity in its procedure has led to severe divisions within its own ranks, but in 1932 the three principal branches of Methodism in England, the British Wesleyan Church, the United Methodist Church and the Primitive Methodist Church, completed plans for consummating a reunion, and on Sept. 20, 1932, were merged into the United Methodist Church.

Methodist preaching followed the British flag to all the British colonies. Itinerants from the United States had a major part in establishing Methodism in Canada where, dispite internal divisions which for a time impeded its progress, the Canadian Methodist Church became the largest denomination in the dominion, and led in the formation of the United Church of Canada in 1925 which includes what were the Methodist, Presbyterian and Congregational bodies. In Ireland, after an initial period of swift growth, the economic troubles which depleted the population of the island about the middle of the last century brought great losses to the Church. It remains, however, one of the strongest Protestant bodies in the island. In Australia and in South Africa there are flourishing Wesleyan conferences, while Methodist churches founded by the missionary efforts of the American or British congregations are to be found wherever Protestant missions have spread.

Divisions in the United States. Despite a number of internal fractures, the Methodist movement in the United States has maintained a position as one of the largest and most influential Protestant groups ever since the founding of the republic. The first division came in 1792 when the Rev. James O'Kelly, of Virginia, led a group of southern ministers out of the Church over the issue of the unrestricted powers of bishops in making appointments. This secession led later to the formation of the Christian Church, which in 1931 united with the Congregational Church. In 1800 the dissatisfaction of colored congregations in Philadelphia and New York led to the formation of the African Methodist Episcopal Zion Church; this was followed in 1816 by the founding of the African Methodist Episcopal Church. In 1830, following an unsuccessful attempt to increase the powers of laymen, another group withdrew to form the Methodist Protestant Church. And in 1843 a smaller group, which had been active in the abolition movement, separated to form the Wesleyan Connection in America.

The most important division came, however, following the general conference of 1844, at which Bishop James O. Andrew, of Georgia, was suspended from exercising episcopal functions because of his ownership of slaves. Delegates from the South, incensed at what they considered an unconstitutional procedure on the part of the northern majority of the conference, withdrew to form the Methodist Episcopal Church, South, which held its first general conference in 1846. The division was a significant portent of the later sectional strife which was to rend the nation. Several efforts have been made to reunite the two branches of the Church which separated in 1844, but so far without success.

The growth of the various branches of the denomination has approximately kept pace with the national growth in population since the close of the Civil War. The Methodists have been noted for their interest in measures of philanthropy and reform; they have also supported one of the most extensive systems of theological seminaries, colleges and academies to be undertaken by any of the American denominations. Celebrations of the centenary of Methodist preaching in America, in 1866, and of the centenary of Methodist missionary effort, in 1919, led to ambitious building programs and the expansion of many forms of activity, both in the United States and on many mission fields. In the second of these centenary celebrations the three principal branches, the Methodist Episcopal Church, the Methodist Episcopal Church, South, and the Methodist Protestant Church, cooperated.

The latest statistics for the various branches of Methodism in the United States, published by the *Christian Herald* in May, 1931, show:

	Ministers	Churches	Communicants
Methodist Episcopal	18,040	25,207	4,537,769
Union Am. M.E. Colored	331	309	22,301
African M.E.	7,002	7,401	790,000
African M.E. Zion	3,460	3,882	500,000
African Union Meth Prot.	675	650	27,000
Methodist Protestant	2,175	2,250	190,000
Wesleyan Methodist	791	612	22,881
Reformed Methodist	15	14	381
Methodist Episcopal, South	8,001	16,450	2,608,496
Congregational Methodist	487	357	21,050
New Congregational Methodist	25	26	1,229
Reformed Zion Ul Apostolic (col.)	43	58	4,086
Colored Methodist Episcopal	2,619	3,601	338,771
Primitive Methodist	85	88	12,374
Free Methodist	1,399	1,279	40,827
Reformed Meth. Union Episcopal (col.)			1,904
Total Methodists (16 bodies)	45,799	62,211	9,119,069

P. Hu.

METHOW, a North American Indian tribe speaking a dialect of the Salishan linguistic stock. They formerly occupied the banks of Methow River and Chelan Lake in Washington. A few are now said to be on the Colville River Reservation in Washington.

METHUEN, a town and village in Essex Co., northeastern Massachusetts. The village is situated on the Spicket River, about 10 mi. northeast of Lowell, and is served by the Boston and Maine Railroad. Methuen has numerous factories making chiefly textiles and shoes. The factory output of the town for 1929 was worth about $5,000,000. Methuen was

separated from Haverhill and made a town in 1725. Pop. 1920, 15,189; 1930, 21,069.

METHUSELAH, one of the 10 antediluvian patriarchs (Genesis 4:18; 5:25), also called Methusael. Both Bible traditions say that he was the father of LAMECH, and lived to the age of 969, the oldest attained by any Biblical character. Certain students who regard his name as containing in "selah" a Hebraized form of the Babylonian "sarhu" think he may have legendary associations with an early fire god. Great as is his Bible age, it is not so great as that of his Babylonian counterpart. The 10 antediluvian Bible heroes lived an aggregate total of 8,575 years; but the 10 antediluvian Babylonian kings lived an aggregate of 432,000 years.

METHYL ACETATE, a colorless liquid ESTER having an agreeable odor and being soluble in water and organic solvents. It is prepared from methanol and calcium or sodium acetate; or, more generally, from acetic acid and sulphuric acid. It has the chemical formula CH_3COOCH_3, specific gravity 0.933 and boils at 57.1° C. It is used as a solvent.

METHYL ALCOHOL. *See* METHANOL.

METHYLATED SPIRIT. *See* ALCOHOL, INDUSTRIAL.

METHYL CHLORIDE, a colorless gas, CH_3Cl, with ester-like odor, poisonous after prolonged exposure, soluble in various organic liquids; its boiling point is —23.7° C. and its chemical properties are similar to those of ETHYL CHLORIDE.

It is manufactured by two methods: (1) the interaction of hydrochloric acid on methyl alcohol, either in the gaseous phase or in aqueous solution under pressure and; (2) by the direction chlorination of methane in the presence of metallic chloride catalysts and diluent gases, such as N_2, HCl or excess methane. The product is purified by washing with aqueous alkali, drying with sodium carbonate and vaporizing from impurities.

Methyl chloride is a methylating agent in preparation of dimethyl aniline and antipyrine, and is a component of liquid for refrigerating machines.

E. C. B.

METHYL COMPOUNDS may be represented as the methane molecule, CH_4, with one of the hydrogens substituted by an element or a group of elements, as in methyl alcohol, methyl chloride, methyl amine, methyl sulphate and methyl benzene. Only recently, the methyl group, CH_3, was isolated for a fraction of a second. It either combines instantaneously with an element or with itself to form ethane, $H_3C - CH_3$. The properties of the methyl compounds depends upon the element or group of elements with which it is combined. The simplest of these is methyl hydride or methane.

METHYLENE BLUE, a basic coal-tar dye ($C_{16}H_{18}N_3SCl$) of the thiazine class, occurring in the form of a finely crystalline, bluish powder with a bronze-like luster. It may be prepared by heating amidodimethyl aniline with sulphide of iron. It is used as a stain for biological specimens. It is of some value as a urinary antiseptic in the treatment of malaria and gonorrhea.

METHYL ORANGE, a coal-tar color of the azo-group having the formula $(CH_3)_2N{\cdot}C_6H_4{\cdot}N_2{\cdot}C_6H_4{\cdot}SO_3Na$, also known as mandarin orange, gold orange and helianthin. It is an orange crystalline powder which forms a yellow solution in water. It is used chiefly as an indicator. *See also* INDICATORS, CHEMICAL.

METHYL RED, a basic coal-tar color, of the azo-group of compounds, having the chemical formula $N(CH_3)_2{\cdot}C_6H_4{\cdot}N_2{\cdot}C_6H_4{\cdot}CO_2{\cdot}Na$. It may be prepared by combining benzene diazonium carboxylate and dimethylaniline. It is used largely in chemistry as an indicator. *See also* INDICATORS, CHEMICAL.

METHYL VIOLET, a basic coal-tar color ($C_{24}H_{28}N_3Cl$) of the triphenyl methane group, also called Paris violet. It may be made by the oxidation of dimethyl aniline with metallic salts.

METONIC CYCLE, the interval of time which elapses between the occurrence of a certain phase of the moon and its recurrence upon the same day of the month in another year. Thus, if the full moon occurs upon Jan. 1 of one year, the metonic cycle is that period of time elapsing until the full moon again falls upon Jan. 1. This interval, which must obviously be equal to a whole number of years as well as to a whole number of months, equals 19 years and 235 months. It was named after Meton who discovered it about 433 B.C., and is used in fixing the date of Easter, which is the first Sunday following the first full moon following March 21.

METONYMY, naming a significant accompaniment or aspect of an object instead of the object itself, e.g., "the bench" instead of "the judge on the bench," "Shakespeare" instead of "the works of Shakespeare," "the pen" and "the sword" instead of "the instruments of peace" and "the instruments of war," etc. Formerly, metonymy was regarded as quite distinct from SYNECDOCHE, but more recent rhetoricians agree that it is best to consider them together, not so much because it is difficult to distinguish to which class a



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figure may belong, as because they are essentially the same in method and principle. Each singles out that quality of an object or that circumstance connected with it which is the real center of interest at the moment, and concentrates upon it. K. D. S.

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METOPE, in classic architecture, the stone slab which, in a Doric frieze, filled the square openings between the triglyphs or vertical blocks carved with grooves (*see* TRIGLYPH); also any decorative form of the same type in any material. In Greek architecture, the metope was a favorite spot for sculptural decoration.

METRIC SYSTEM, a system of weights and measures having the meter as the basic unit. The system was invented by the French in the 18th century on the theory that the meter was 1/10,000,000 of a quadrant of a terrestrial meridian. Subdivisions and multiples of the meter were taken according to the decimal system. The subdivisions were designated by the corresponding Latin prefixes: *centi, deci* and *milli;* and the multiples by the Greek prefixes: *deca, hecto, kilo* and *myria.* From the meter was created the unit of capacity, the *liter,* comprising 1,000 cubic centimeters, with subdivisions, multiples and prefixes corresponding to those of the meter. The unit of weight, the *gram,* was taken as 1/1,000 of the weight of a liter of water at its maximum density.

The relation of the units of the metric system to the natural units on which they are based is nominally correct, but, with the development of more accurate means of measurement, they have been found to be slightly in error. The meter is 0.175 m. shorter than 1/10,000,000 of a meridinal quadrant, and the length of the quadrant is not constant. Therefore, the meter is now defined as the distance between the terminal lines on the international prototype meter, a bar of platinum-iridium at the INTERNATIONAL BUREAU OF WEIGHTS AND MEASURES, at the temperature of melting ice. The weight of a liter of water may, for all practical purposes, be taken as a *kilogram,* but that relation is not absolutely accurate. The relation between the metric system and the English system of weights and measures is shown by the following common conversion factors: 1 inch = 2.54 centimeters, or 1 meter = 39.37 inches; 1 kilogram = 2.2046 pounds avoirdupois, or 1 gram = 15.432 grains; 1 liter = 1.057 United States liquid quarts (0.8799 British liquid quarts) or 1 cubic inch = 16.39 cubic centimeters.

The metric system originated from the need for a scientific system of weights and measurements based on natural and invariable units and so arranged in multiples and subdivisions that it could be readily applied to commercial usage. From three proposed units, the length of the seconds pendulum, a fraction of the length of the equator, and a fraction of a quadrant of the terrestrial meridian, the latter was selected. A committee was subsequently appointed to measure the length of a meridian and another to draw up the system of weights and measures based on the unit selected. The report on the length of the meter was not made until 1799, and in December of that year the values of the metric units were fixed by law, the system becoming compulsory in France in 1801. It was the intention of France to have the system adopted internationally and an international commission to consider a uniform system of weights and measures was assembled in Paris in 1870. Out of this grew the International Bureau of Weights and Measures, the primary function of which is to make prototypes of the meter and the kilogram for the various countries which maintain it. In 1866, the metric system was made legal in the United States. It has likewise been legalized in Great Britain, Egypt, Japan, Russia and Turkey. It is obligatory in Argentina, Austria, Hungary, Belgium, Brazil, Chile, France, Germany, Greece, Italy, Mexico, the Netherlands, Norway, Peru, Portugal, Rumania, Yugoslavia, Spain, Sweden and Switzerland. The metric units are used almost universally in scientific work. *See also* WEIGHTS AND MEASURES.

TABLE OF METRIC UNITS

LINEAR MEASURE

myriameter	= 10,000	meters
kilometer (km.)	= 1,000	meters = 3,280.83 ft.
hectometer	= 100	meters
decameter	= 10	meters
meter (m.)	= 39.37	inches
decimeter (dm.)	= 0.1	meter
centimeter (cm.)	= 0.01	meter
millimeter (mm.)	= 0.001	meter
micron (μ)	= 0.000001	meter

SQUARE MEASURE

1 square myriameter	00	square meters
1 square kilometer	00	square meters
1 square hectometer (hectare) =	10, 00	square meters = 2.471 acres
1 square decameter (are)	00	square meters
1 **square meter**		square feet
1 square decimeter		square meter
1 square centimeter		square meter
1 square millimeter =	0.000001	square meter

CUBIC MEASURE

cubic myriameter	= 10^{12}	cubic meters
cubic kilometer	= 10^{9}	cubic meters
cubic hectometer	= 1,000,000	cubic meters
cubic decameter	= 1,000	cubic meters
cubic meter	= 35,315	cubic feet
cubic decimeter	= 0.001	cubic meter
cubic centimeter	= 0.000001	cubic meter
cubic millimeter	= 0.000000001	cubic meter

WEIGHT

1 metric ton (t.)	= 1,000,000	grams = 1,000 kilograms
quintal (q.)	= 100,000	grams = 100 kilograms
myriagram	= 10,000	grams = 10 kilograms
kilogram (kg.)	= 1,000	grams = 2.2046 lb. avoir.
hectogram	= 100	grams
decagram	= 10	grams
gram (g.)	= 15.432	grains = 0.0022 lb. avoir.
decigram (dg.)	= 0.1	gram
centigram (cg.)	= 0.01	gram
milligram (mg.)	= 0.001	gram
microgram (γ)	= 0.000001	gram

CAPACITY

hectoliter	= 100	liters
decaliter	= 10	liters
liter (l.)	= 0.908	dry qts. = 1.0567 liquid qts.
deciliter (dl.)	= 0.1	liter
centiliter (cl.)	= 0.01	liter
milliliter (ml.)	= 0.001	liter
microliter	= 0.000001	liter

METROLOGY, the science of weights and measures or the science of measurements in general. A metrologist is one who specializes in the science of measurement. Metrology deals fundamentally with the determination of length, mass and time. Secondary to these are their derivative quantities, velocity, density, volume and the like. In connection with these measurements, such auxiliary measurements as those of barometric pressure, thermal expansion and temperature must be made.

Since the determination of the more complicated physical quantities depends upon the accuracy of the fundamental measurements, great care must be taken in the establishment and comparison of standards, comparators and gauges. In general, the accuracy attained in this part of the science of metrology is in the order of an error of one part in 10^6. Four different standards are used in metrology. There are primary standards, of which there is only one for each unit; secondary standards, made as nearly identical with the primary standards as possible and serving different localities; tertiary standards, made from the secondary standards and used in reference work; and working standards, those in everyday use.

The apparatus used in metrology includes that used in comparing standards (*see* COMPARATORS; BALANCE; CHRONOGRAPH); subsidiary apparatus, such as BAROMETERS and thermometers (*see* THERMOMETRY); working instruments used in everyday use, as engineers' scales and gauges, surveyors' tapes, hydrometers and capacity measures (*see* MEASURING TOOLS; SCALES; HYDROMETERS; COMBUSTION CONTROL INSTRUMENTS; CALORIMETRY; TRANSIT; AERIAL NAVIGATION INSTRUMENTS; NAVIGATING INSTRUMENTS; ASTRONOMY.

All material standards of metrology have to be made to embody permanence, invariability and facility to the greatest possible extent. Standards made of platinum-iridium have been found the most permanent and invariable although they are not ideal. Facility is a matter of design. Natural constants, such as the WAVE-LENGTH of LIGHT, are the best standards, and the standard meter (*see* METRIC SYSTEM) has been calibrated in those terms; should this standard meter be destroyed, it could be accurately restored.

Modern metrology involves a wide use of optical, electrical and photo-electrical apparatus, which can be made to operate automatically and without the error that necessarily enters manual operations. *See also* PHOTO-ELECTRICITY; ELECTRICITY; DIVIDING ENGINE; WEIGHTS AND MEASURES; STANDARD TIME; SPECTROSCOPY.

METRONOME, an instrument used in music instruction, in composition, and production, invented by Winkel, a Dutch musician, about 1800 and perfected and manufactured by Johann Nepomuk Maelzel. The instrument enables a composer to indicate precisely the speed of his compositions. It consists of a graduated pendulum actuated by clockwork, the former beating at different rates according as a sliding bob attached to it is raised or lowered. When the bob is placed opposite the graduation marked 60, the pendulum beats sixty times a minute; when opposite 70, seventy times, and so on. Since Maelzel's name has been identified with this instrument, the letters "M.M." are generally written before the composer's directions which take the form of a note of some given value and the number to which the metronome is to be adjusted. Thus, M.M. = 70 signifies that 70 quarter notes must be played in one minute. By adjusting his metronome to that number, the performer is able to play at the exact velocity intended by the composer.

METROPOLIS, a city in the extreme south of Illinois, the county seat of Massac Co., situated on the Ohio River, 196 mi. southeast of St. Louis, Mo. The city is served by four railroad lines, bus lines and river craft. It is shipping center for grain, lumber and its own manufactured products, chiefly underwear, cotton gloves and wooden ware. East of Metropolis stand the ruins of Ft. Massac, built by the French in 1757, captured by the British a few years later and taken by George Rogers Clark in 1778. Metropolis was founded in 1830 and incorporated in 1839. Pop. 1920, 5,055;

METROPOLITAN, a dignitary of the Greek Church, in general the same as an archbishop. A metropolitan church is thus the same as the cathedral of an archbishop. In the ancient church the bishops of the larger provinces looked upon the bishop of the metropolis as their head. There were also metropolitans over other metropolitans, who had the titles of PATRIARCH and EXARCH. In the Western Church the jurisdiction of metropolitans developed from the time of Charles the Great, but from that time the dignitaries were called archbishops.

METROPOLITAN AREA, a thickly populated area having common economic and social interests but without a common local government. Boston had a population of about 781,000 in 1930 while the thickly populated area of which it is the center had over 2,000,000. The metropolitan area of New York covers parts of three states, all or parts of 22 counties and more than 400 cities, villages and other minor units. According to the census of 1930 the Metropolitan area of New York is greater than that of London. Some metropolitan districts have been created to provide for whole areas, services such as water supply, sewerage, parks, etc. Greater Berlin was created in 1920 on broad enough lines to provide a common local government for the whole Berlin metropolitan area. Plans for similar consolidations, leaving some authority to existing units of local government, have recently been agitated in Boston, Pittsburgh, St. Louis, Cleveland and San Francisco. T. H. R.

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METROPOLITAN MUSEUM OF ART, New York, one of the great art museums of the world, and the largest in the United States. The original building, on the present site on the west side of Fifth Avenue, between 80th and 84th streets, was an unpretentious red-brick structure with granite facings,

erected in 1880 and leased from the municipality by the National Academy of Design. Wings were added in 1888 and 1894, and the east façade, providing niches for sculptures and space for medallions, was constructed in 1902 and 1908, after designs by Richard Morris Hunt. There are 340,232 sq. ft. of exhibition floor space. The institution was incorporated Apr. 13, 1870, for "the purpose of maintaining a museum and library of art, of encouraging and developing the study of the fine arts and . . . of furnishing popular instruction." A large and increasing number of gifts and purchases, embracing both the fine and decorative arts, has given the museum a superb collection of exhibits illustrating man's effort throughout the ages to attain an ideal of beauty. Apart from the paintings, which in 1932 numbered 2,400, the exhibits comprise objects in marble, stone, wood, pottery, porcelain, glass, metal, lace, textiles, tapestry and other materials, ranging in date from 3000 B.C. to the present. They include the Carnavon group and the exhibits of Near Eastern Art, donated in part by Robert W. and Lockwood de Forest, with examples of Indian wood- and stone-carving, jewelry and enameled glass; the Near Eastern manuscripts and miniatures, with rare examples of Turkish and Persian calligraphy and painting, are in large part the bequest of Alexander Smith Cochran; a third section devoted to the Near East displays a retrospective collection of rug-weaving, many of these examples being the gift of James F. Ballard. The Far Eastern exhibits of the Metropolitan comprise a fairly comprehensive collection of Japanese and Chinese sculptures, bronzes, paintings, prints, textiles, ceramics and laquers. In these Oriental collections the museum has one of the greatest in existence.

In the field of painting the Metropolitan, despite its relative youth among museums of the first rank, has acquired by purchase or bequest a collection notable both for the excellence of its examples and for the number of periods embraced. In 1930 the museum received a magnificent bequest, the gift (appraised at $3,489,461 in 1931) of Mrs. H. O. Havermeyer, comprising canvases by Rembrandt, bringing the Metropolitan's total of his works to 26, El Greco, Hals, Goya, Rubens, Corot, Manet, Monet, Dégas, Renoir and others, together with a collection of porcelains, coins and jewelry. In the Pierpont Morgan, Benjamin Altman, Michael Dreicer, Theodore M. Davis, George A. Hearn and lesser collections, together with individual canvases obtained by purchase, the museum presents a representative review of the several styles of the Italian, German, Spanish, Dutch, Flemish, English and American schools. Celebrated artists represented, besides those previously mentioned, include Raphael, Piero di Cosimo, Bellini, Fra Angelico, Giorgione, Veronese Titian, Velasquez, Dürer, Roger van der Weyden, Courbet, Cézanne, Delacroix, Reynolds, Gainsborough, Millet, Ingres and Abbey.

Apart from these treasures the museum possesses a collection of 3,600 musical instruments, representative of all nations; the de Forest exhibits of American crafts and arts, housed in the American Wing, enlarged in Jan. 1932, divided into rooms displaying furniture, china, pewter, utensils, wallpaper and other objects of colonial and early Republican epochs; the group of arms and armor, embraced in the William H. Riggs Benefaction and the Ellis and Dino collections; and a representative display of prints illustrating the history of engraving, etching, woodcutting and lithography.

The Metropolitan Museum is governed by a board of 21 trustees, and is maintained by endowment funds and by an annual appropriation, in excess of $500,000, from the City of New York.

METTERNICH, WINNEBURG CLEMENS WENZEL LOTHAR, PRINCE (1773-1859), Austrian statesman, was born at Coblenz, May 15, 1773. The son of an Austrian diplomat, he grew up in foreign courts and was educated at the University of Strasbourg 1788. Deeply impressed with the atrocities of the French Revolution he retained through life a suspicion of new forms of government. Austrian representative at Dresden in 1801, Berlin 1803 and Paris 1806, he returned to Vienna and became in 1809 Foreign Minister and later, Chancellor. In this capacity he was an important figure in European politics. His clever diplomacy was largely responsible for the isolation of Napoleon in 1813 and in the negotiations for peace after his defeat. His influence at the Congress of Vienna was very great, and much of the reconstruction of Europe was dictated by him. An avid reactionist Metternich hated revolutions and liberalism. He never quite realized the progress that popular government was making in the 19th century, and was driven from power by the revolution of 1848. He was called reactionary, tyrannical, a belated type of the 18th century diplomat, and was hated accordingly. He died at Vienna, June 11, 1859.

METUCHEN, a borough of Middlesex Co., N.J., located 18 mi. southwest of Newark and 6 mi. northeast of New Brunswick. It is served by the Pennsylvania, Lehigh Valley and the Reading railroads and motor bus lines. While mainly a residential suburb, it has several industrial establishments producing ceramics, needles and reclaimed rubber. Pop. 1920,

METZ, a commercial city and capital of the department of Moselle located on the Moselle in northeastern France, one of the world's strongest fortresses. In the Middle Ages it was a free city but was placed under the protection of France in 1552 and definitely united to the country in the 17th century. Always strongly fortified, Metz never yielded to an enemy until conquered by the Germans in 1870. The forts were strengthened under German rule. After the World War Metz was reunited to France. It is a picturesque town with 10 city gates, 14 bridges, and a Gothic cathedral. It carries on agricultural trade, and textile and other manufactures. The poet PAUL VERLAINE was born here in 1844. Pop. 1931, 78,767.

METZ, SIEGE OF, the investment of the French fortress of Metz by the German armies from Aug. 19 to Oct. 14, 1870, following the French defeat at GRAVELOTTE. Not inclined to attack a fortress so powerful as Metz, the Germans encircled it with the intention of starving the French armies into surrendering. Although the French attempted periodical sorties in an attempt to break the siege during the 54 days, they were unsuccessful. By Oct. 14 the effectiveness of the French army had been so much reduced by lack of supplies that Bazaine, the commander, was forced to capitulate. By the surrender France lost approximately 150,000 men and the principal stronghold on the eastern boundary.

MEUNIER, CONSTANTIN (1831-1905), Belgian painter and sculptor, was born at Brussels, Apr. 12, 1831. His interest in the miners and factory workers of Belgium was aroused by the illustrations which he executed for Lemonnier's *Le Tour du Monde,* about 1880. From his unfortunate compatriots he drew the inspiration for his subsequent work. Meunier's sculpture of puddlers and smelters is strong, sympathetic and unsentimental, and his naturalistic interpretations of labor have won him the title of the "Millet of sculpture." He died at Brussels, Apr. 4, 1905.

MEUSE, one of the leading rivers of western Europe. More than 550 mi. long, it rises in northeastern France, flows in a general northeasterly direction across Belgium, serves as boundary between Belgium and Holland and enters the latter country, flowing west to debouch into the North Sea, after branching into two arms. Running at first through a steep-sided valley between towering cliffs, it later traverses the green fields and wooded slopes of Belgium and finally crosses the flat Dutch plains. Its most important affluents are the Sambre, Semoy, Ourthe and Roe rivers. Extensively canalized, it is navigable from Verdun onward. The principal towns along the course are Verdun, Sedan and Charleville in France; Liége and Namur in Belgium and Rotterdam, Maastricht and Dordrecht in Holland.

The Meuse valley became a battleground during the World War, when, in 1914, the Germans followed its path in the invasion of Belgium and France, since it formed the shortest natural route between Berlin and Paris. The region around Verdun was devastated in 1917-1918 when it was the scene of warfare between Allied and German forces.

MEUSE-ARGONNE OPERATION, the second great American offensive, occurring between Sept. 25 and Nov. 11, 1918, and one of the most ambitious military undertakings in the WORLD WAR. Two weeks before, the 1st American Army, Gen. Pershing commanding, had reduced the St. Mihiel salient (*see* ST. MIHIEL, BATTLE OF). The objective of the new offensive, northwest of St. Mihiel, was to break a four-year-old German stronghold, fortified in front by the Argonne Forest, and in the rear by the heights of Vauguois, Barricourt, and Montfaucon, and the bluffs of the Meuse River. To attack this seemingly impregnable area Gen. Pershing had the 1st American army, the XVII French Corps and three French divisions. The offensive was launched on Sept. 26 west of the Meuse, and between the river and the Argonne, and began with a three-hour bombardment. At 5:30 a.m. the general advance began northward, converging on Montfaucon. Cross fire from the Meuse bluffs and the Argonne, combined with the difficulty of advancing men, artillery and supplies over the demolished terrain, slowed Pershing's advance; but the Americans captured Montfaucon on Sept. 28, and Grandpré, the northern end of the forest, on Oct. 10. By the end of the month the army had penetrated the Hindenburg Line, and seized part of the Metz-Mézières railway, a vital line of German communications.

Meanwhile Gen. Gourand, operating on Pershing's left with the French IV army, captured the heights of Barricourt by wheeling northeast, thus encircling the Argonne, and bearing toward Beaumont and Sedan. The outskirts of the latter were reached on Nov. 6-7. The Meuse was crossed south of Dun-sur-Meuse, and Americans and French consolidated new positions, extending their front northeast of Stenay, and facing the Forest of Woevre. The Armistice on Nov. 11 saved the German army from further casualties, which had totaled about 150,000 during the Meuse-Argonne operations. The American casualties totaled 117,000 killed and wounded.

MEXIA, a city in Limestone Co., northeastern central Texas. It is situated 48 mi. northeast of Waco and is served by two railroads. Mexia is the trade center of an oil field region; there are numerous tank farms in the vicinity. The chief agricultural interest is cotton-growing. The city has cotton and cottonseed oil mills. Pop. 1920, 3,482; 1930, 6,579.

MEXICAN AND CENTRAL AMERICAN INDIANS, LANGUAGES OF, a geographical rather than linguistic term for the aboriginal languages spoken in Mexico and Central America.

Generally these tongues have grammatical genders distinguishing between animate (both rational and irrational) and inanimate; while the verb is differentiated from the noun by the use of the personal pronoun for subject, and is sometimes "incorporating," e.g., Tarascan *hopo-ni* "wash," *hopo-ku-ni* "wash the hands," *hopo-ndu-ni* "wash the feet." Tenses may be formed either by prefixes or suffixes, and the system of enumeration is largely quinario-vigesimal, i.e., by fives and twenties, e.g., Nahuatl *se* "one," *tshik-a-sen* "five plus one"="six", *sem-puali* "twenty," *sem-puali om matlaktli* "twenty plus ten"="thirty," etc. The linguistic stocks seem to be 20 in number (exclusive of Uto-Aztec, Na-Dene and Hopi, which Mexico shares with the United States): Amusgo, Chinantec, Kuikatec, Kuitlatec, Lenka, Maya, Miskito-Sumo-Matagalpa, Mixe-Zoke, Mixtec, Olive (extinct), Otomí, Paya, Subtiaba, Tarasc, Totonac, Waikuri (extinct), Xanambre (extinct), Xikake, Xinca and Zapotec, most of these having a number of sub-divisions. Nahuatl (Aztec), Mixtec, Otomí, Zapotec, etc., are recorded in

a number of codices from the time of the Spanish Conquest, while Maya has not only manuscripts of similar type, but also HIEROGLYPHIC inscriptions dating from the pre-Columbian period. L. H. G.

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MEXICAN WAR, 1846-48, a conflict between the United States and Mexico. The fundamental cause was the belief of a probable majority of Americans that the "Manifest Destiny" of the United States was to acquire all the territory between the western boundary and the Pacific Ocean, a motive intensified by the demand of pro-slavery citizens for an extension of slave territory. President Polk was obsessed with the desire to acquire the northwest provinces of Mexico, California in particular; with the administration party in control of Congress, this desire patently entailed war if a purchase were not possible. The immediate causes were the Mexican hostility to the annexation of Texas (*see* SLIDELL'S MISSION), the failure of the Mexican Government to satisfy American claims for depredations upon commerce, confiscation of property, and the dispute over the Texas boundary. In the latter issue the Mexican Government construed the boundary to be the Nueces River, while the Texan claim extended to the Rio Grande. The invasion of the intermediate territory by Mexican troops brought about a declaration of war by the United States Congress, May 12, 1846. The plan of operations outlined by President Polk called for a military expedition into Mexico, toward the capital city, and the seizure and occupation of New Mexico and California. Gen. ZACHARY TAYLOR commanded the expedition into Mexico, winning successively the battles of Palo Alto, Resaca de la Palma, Monterey and Buena Vista. Meanwhile Gen. Kearny, having taken Santa Fe, proceeded to California to find the conquest of that region already achieved by the American naval forces. Largely for political motives, Gen. Taylor was succeeded in active command by Gen. WINFIELD SCOTT, his senior officer, who landed at the port of Vera Cruz, took the city, and proceeded toward the capital. Desperately contesting his advance, the Mexicans were defeated at Cerro Gordo, Contreras, Churubusco, Molino del Rey and Chapultepec. After the loss of the latter fortress, within three miles of Mexico City, the Mexican army evacuated the capital, Sept. 14, 1847. The TREATY OF GUADALUPE HIDALGO, Feb. 2, 1848, formally ended the war. *See* separate articles on the individual battles. For army medical service *see* ARMY, U.S., MEDICAL SERVICE.

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MEXICO, officially termed *Estados Unidos Mexicanos,* Spanish *Mejico,* so called from Mexica, another name of the Aztecs, a federal republic in the southern part of North America between 14° 56′ N. lat. and 32° 22′ N. lat., 86° 49′ W. long., to 117° 9′ W. long. Including the islands, it covers 757,907 or 762,290 sq. mi., according to different authorities, the first figure being official. It extends from the United States on the north to Guatemala and British Honduras on the south, and from the Pacific Ocean on the west to the Gulf of Mexico and the Caribbean on the east.

The advantage of access to the sea on two great oceans is lessened on account of the character of the coasts and also by the soil. Extensive facilities had to be provided at Tampico and Veracruz, and at Yucatan vessels must ride at anchor in the roadstead. The good natural harbors on the Pacific coast are difficult to reach from the interior. The bays of St. Blas and Mazatlan can accommodate small ships only; others are at the mercy of the sea in the west and southwest. The good roadsteads of Lower California can serve only a limited and poor hinterland. The most important islands are the Three Marias, Tiburon, Angel de la Guardia, Guadalupe and Revillagigedo.

A large, high plateau extends from the United States in a wedge-shaped form into the Isthmus of Tehuantepec. Only the peninsula of Lower California with its own mountain range is separated, as the peninsula of Yucatan and the states of Tabasco and Chiapas really belong geographically to Central America.

The two large mountain ranges on the eastern and western sides of the great plateau extend from the American border to the isthmus. The rivers cut through the mountain chains in deep gorges or barrancas which are sometimes as deep as 900 ft. On account of the numerous falls, the great changes in the amount of water and the many inundations, the rivers are of little use for shipping or industrial purposes. Rivers flowing into the Gulf of Mexico are the Rio Grande del Norte and the Grijalva; those into the Pacific Rio de las Balsas, Rio Lerma, Rio de Sinaloa. Among the lakes the most important are Chapala, Tezcoco and Chalco. Thermal and mineral springs are very numerous.

Mexico is rich in minerals. Gold is found in Lower California and Oaxaca, silver and lead ore in the states of Zacatecas and San Luis Potosi. There is quicksilver near Guadalcazar, copper in Lower California, Michoacan and Sonora, iron ore and tin in Durango. Salt is found in San Luis Potosi and in the coastal lagunes. Opal of beautiful colors comes from Zimapan and Queretaro. Puebla and Oaxaca are rich in marble and onyx. The most important product is oil, which is found in the north and east, but there is very little coal. Mexico has, since its discovery, produced more silver than any other country.

Climate. The hot lands, *tierras calientes,* rising to about 3,000 ft., include the coasts and other territories. The mean temperature ranges between 77°

and 82°, but sometimes rises even higher than 100°. The subtropical region, *tierra templada,* rising to an elevation of about 6,000 ft., has a mean annual temperature of about 70°. Above this, ranging from 6,000 to over 8,000 ft., is the cool region or *tierra fria,* which has about the same average temperature as central United States, but with less variability and little frost. Higher up in the sierras grain is grown and cattle graze.

Population. The population in 1930 consisted of 30% descendants of full blood native Indians, some of whom speak no Spanish; 60% half-breeds (mestizos and mulattoes) and only about 10% white, mostly Spanish creoles. The natives have best maintained their racial integrity in the tropical and in the mountain regions. They are strong and well built, with great powers of resistance and can do hard work. They learn quickly and are easily led. The mestizos are a fine, intelligent group, which take a prominent part in politics. The southerly tableland has the densest population. The total inhabitants in 1930 were 16,404,030. Mexico consists of twenty-eight states, four territories and the Federal District or *Distrito Federal* with the capital city of MEXICO CITY, which, with the exception of Guadalajara, is the only large city in the country. The cities having more than 50,000 inhabitants are Puebla, Monterey, Merida, San Luis Potosi, Tacubaya, Vera Cruz, Leon and Torreon.

Religion and Education. The Mexican constitution grants toleration to all religions, but the population is overwhelmingly Roman Catholic. Since the confiscation of the ecclesiastical lands, the clergy are dependent upon the support of the faithful.

Since 1863, free compulsory education has been introduced and the results have been promising. Besides the 14,231 state and communal schools, which have improved greatly, there were, in 1923, 7,414 private and church schools. There are also many higher institutions of learning, at the head of which stands the National University in the capital and universities at Guadalajara and Merida, followed by seminaries, technical schools, commercial trade and art schools, agricultural, engineering, mining and other schools and colleges. The higher education is, in general, based on French models. There are also a national art academy, a national library and numerous other libraries, museums and scientific societies. In 1910, 78% of the people were illiterate, but conditions have improved since that time, with an illiteracy rate at present of only 60%.

Flora and Fauna. The hot regions have an overwhelming number of plants, including trees of hundreds of species, palms, ferns, lianes and parasitic plants. Valuable are the cabinet woods, ebony, mahogany and rosewood. There is a large number of medical and oil-bearing plants. In the *tierra templada* are banana, coffee and orange trees, oaks, pines and bamboos, mimosa, magnolias, acacias, orchids and tree-like ferns. The *tierra fria* has cereals, countless varieties of cactus and the characteristic agaves.

Mexico, as regards fauna, is part of the Central American neotropical region and has species of its own, as the ocelotl, five species of monkeys, ant-bears and armadillo, three species of deer, the Mexican big-horn, many animals found in the Southern United States and many birds of gorgeous plumage.

Production and Industry. Until the revolution of 1911, large estates were prevalent. The chief cereal is Indian corn, supposed to have originated in Mexico, and corn bread, tortilla, is the daily bread. Corn is grown from the *tierra caliente* up into the *tierra fria* and there are frequently two crops a year. To a lesser extent barley is cultivated, as well as wheat, on the tablelands only, and beans, but the quantity is insufficient and limited amounts are imported. Rice is grown on the coast in Michoacan, Vera Cruz, Tepic and Tabasco. Potatoes and sweet potatoes are also cultivated. In the tropics, bananas are an important food product. Among the fruits introduced from Europe, oranges, as well as ordinary and sweet lemons flourish. Peaches, apricots, apples and pears grow everywhere on the tablelands. Grapes are cultivated mostly near Parras, on the Rio Grande del Norte and in Sonora. The agave, the great American aloe, furnishes the juice from which the widespread and popular intoxicating drink, pulque, is prepared, while the juice of the *agave mexicana* is used to make mescal brandy. Olive trees are cultivated only in the environs of Mexico City. Cane sugar is grown in Morelos, in the valley of Cuautla, in Tamaulipas, Sinaloa and in Vera Cruz. A good quality of coffee is produced in Vera Cruz, Michoacan and Chiapas, but the crops vary greatly. Cacao flourishes only in the real tropical districts of Tabasco and Chiapas. Good tobacco is grown nearly everywhere, but the crop fluctuates. The most important spices are Spanish pepper and vanilla, which also grow wild. Little cotton is grown, but of considerable importance are the fibers of the *agava sisilana,* which furnishes sisal hemp, and the *agava americana,* which produces aloe hemp; both grow in Yucatan. The ancient cultivation of the nopal, a species of cactus, for the growing of cochineal lice is still carried on in Oaxaca, but has declined greatly owing to the almost universal employment of aniline dyes. Forests cover about a fifth of the area, the tropics being rich in valuable woods for building and cabinet work, which, together with caoutchouc, form an important part of Mexico's exports. Cattle raising is extensively carried on, particularly in the savannahs on the eastern slope of the tableland and in the dry northern plateau states. The Mexican horses are strong and enduring and are used almost exclusively for riding, as mules and asses are used to draw carts and carriages and as beasts of burden. In 1925 there were 438,000 horses, 863,000 asses and mules, 2,925,000 cattle, 1,005,000 hogs, 1,162,000 sheep and 3,179,000 goats.

Even before Cortes's time, fine cotton goods were made in Mexico, and in 1924 there were 108 factories with 762,463 spindles. The manufacture of blankets, "sarapes" and "rebozos" flourishes in Puebla, Tlaxcala and San Miguel. There are also tobacco and

sugar factories, distilleries, breweries, earthenware and paper factories, factories for tanning and making saddles and gold and silver filigree work. Trade has increased steadily, despite the fact that, in the interior, footpaths are frequently the only means of communication, but the extension of the railway system has made considerable progress. In 1925, there were 20,972 mi. of railways and 279 mi. of electric street railways. The lines uniting the two seacoasts are important, the oldest of them being the Tehuantepec. In 1921 there were 76,100 mi. of telegraph lines, 67,340 mi. of telephone lines and several cables to foreign countries, as well as 24 radio-telegraphic stations. The shipping is almost entirely under the American, British and German flags.

The principal imported articles are food products, textiles, coal, chemicals and machines, the value of which was 391,000,000 pesos in 1926. The value of the exports was 682,500 pesos and consisted of four-fifths of oil, silver and other mineral products and one-fifth of vegetable products. The largest part, 61%, of the foreign trade passed through the Atlantic ports and the American frontier. The United States is by far the most important factor in Mexican economics, as the country is largely financed by American capitalists, who have acquired valuable concessions.

Government. According to the constitution of 1824 as amended in 1857, and again in 1917, the president must be 35 years old, is elected directly by the people for a term of six years and cannot succeed himself. The Congress consists of the Senate and House of Representatives, both elected directly by the people. The Senate consists of two members from each state, whose terms are of four years. The House has 258 members elected for terms of two years. The Supreme Court consists of 11 justices elected for life by the Congress. The several states have their elected governors, legislatures and state supreme courts. The constitution is patterned on that of the United States.

Finance. The peso, equivalent in theory to fifty American cents, is the monetary unit. The Mexican government established the Banco de Mexico and the Banco de Credito Agricola in 1925 and 1926 respectively. In 1927 the estimated revenues were $334,000,000 and the expenditures $327,000,000. The total Mexican external debt in 1922 amounted, including $200,000,000 for interest in arrears, to $700,000,000.

Defence. Mexico has an army with active service for three years and seven years in the reserves. The actual strength is 50,000 men; 60 regiments of infantry, 80 of cavalry, two artillery regiments and a flying squad. The officers are usually educated at the Military Academy in the Chapultepec Castle, although some are selected from the non-commissioned officers. The war fleet, consisting of an old armored coastal cruiser of 1898, three small torpedo boats and seven old cannon boats, is of no military value.

MEXICO, HISTORY OF. The establishment of Spanish dominion in New Spain, now Mexico, was initiated by HERNANDO CORTÉS in 1519. From Mexico City, which was conquered in 1521, the conquest spread in all directions. In the later 18th century the viceroyalty of New Spain included the islands of Cuba, Espanola and Porto Rico; the captaincy general of Guatemala, practically all of Central America; the Philippine Islands; all of present Northern Mexico; and that part of the present United States south and west of a line drawn from San Augustine, Fla., by way of New Orleans, to St. Louis, and thence to San Francisco. Late in the 18th century the northern provinces as far east as Texas, menaced by Indians and foreign aggressors alike, and unable longer to be protected adequately from Mexico City, were detached from the viceroyalty of New Spain and erected into the commandancy general of the *Provincias Internas.*

Stirred by the overthrow of FERDINAND VII and the placing of JOSEPH BONAPARTE on the Spanish throne in 1808, ambitious Creoles in Mexico City reasoned that sovereignty which formerly reposed in Ferdinand had, with his deposition, been transferred to New Spain. Accordingly, they demanded greater political and commercial privileges, but without success. While this contest waged between jealous Gachupines and ambitious Creoles, Father Miguel Hidalgo Costilla, a member of the lower clergy, ambitious for the socio-economic uplift of the masses, led an uprising which assumed the character of a race war under the patronage of the Indian saint, the Virgin of Guadalupe. In the face of a common danger, Gachupine and Creole forces fused under the patronage of the Virgin of Los Remedios. Hidalgo was soon captured and executed; but his historic mission had been to initiate a movement that continued after him. Morelos, also a priest, and a military genius, now led the movement and called a Congress which declared the independence of Mexico and drafted a constitution for the country. Morelos was captured and shot in 1815, and until the rise of Guerrero in 1819 the native cause suffered severe reverses.

A revolution gave Spain a Liberal government in 1820. As a result, the conservative classes of New Spain, who had successfully opposed separation from Spain, now saw the possibility of retaining more of their privileges under an independent New Spain than under Liberal Spain. The outcome was a compromise agreement in 1821, known as the Plan de Iguala, between Guerrero and Iturbide, the leader of the privileged groups, by which Mexico was to become an independent empire, with the Catholic religion alone permitted, and with the theoretical equality of all groups.

Republic Established. Inability to secure a European prince demoralized the imperial cause, a demoralization which was accentuated when Iturbide made himself emperor. A republican movement sent him into exile in 1823 and established a Provincial Republican Government which called a constituent Congress to draft a Republican constitution. After a bitter fight between proponents of Federalism and Centralism a Federalist constitution was adopted in 1824.

For the next few decades Mexican political doctrinaires and militarists endeavored to decide between Federalism, Centralism, and ANTONIO DE SANTA ANNA, while the masses, ignored, sank into greater degradation. Temporarily triumphant from 1824-34, Federalism was for a time downed when its chief defender, Santa Anna, switched from the Federalists to the Centralists. For a decade, a Centralized Government was in control in Mexico. For this political experiment, which gave a legal basis for rebellion, Mexico paid with the loss of the province of Texas, inhabited chiefly by people from the United States who were drifting inevitably toward rebellion. On the eve of the war with the United States in 1846, a war fought chiefly over the unsolved questions arising from the annexation of the Republic of Texas to the United States, the Federal system was restored. Despite the outcome of the war and the humiliating cession of one-half of Mexican territory in the Treaty of Guadalupe Hidalgo, Federalism survived in Mexico for seven years. Coming into power again in 1853, Santa Anna dared Federalists and Centralists alike and ruled as dictator. The United States profited by Mexico's discomfiture and extra-legal government through the GADSDEN PURCHASE in 1853. Santa Anna's exile in 1855 caused the renewal of the struggle between the Federalists and the Centralists, but it brought to the front the constructive statesman, Comonfort, and the incomparable patriot, BENITO JUAREZ. Under their leadership the Federalists triumphed, and the constitution of 1857 was promulgated. It is notable for its provisions designed to give equality to citizens before the law and to provide land for the masses by obliging the Church to transfer its holdings to its tenants for compensation.

Federalism and Liberalism as embodied in the new constitution were definitely established in 1857; but their permanence was not assured for 10 more years. As first President under the Constitution of 1857, Comonfort disavowed it in less than three weeks after his inauguration, and in the interest of harmony, made common cause with the Clericals, supported by the Centralists and the Conservatives, for a new constitution. Juarez, as the next in succession for the presidency, championed the cause of outraged constitutional Federalism. Forced on the defensive for three years, Juarez was able to enter Mexico City in triumph in Jan. 1861. Recognition of his Government by the United States during the civil struggle was a diplomatic triumph for the Constitutionalists. Another outstanding incident of the period was the punitive action begun by Juarez against the Church, whose landed property was now confiscated, in part, as punishment for its hostile attitude toward the Constitution of 1857.

Intervention by European Countries. Despite its triumph over Clericalism in 1861, Federalism had, for the next six years, to defend not only itself, but even the sovereignty of Mexico. The suspension by Juarez of the interest on the foreign debt was the motive for armed intervention by Spain, England and France. The ambition of Napoleon III to refound a colonial empire in the form of a mandatory monarchy in Mexico was the motive for the intervention of France in the internal affairs of Mexico and also for the withdrawal of Spain and England. Timely was Napoleon's dream, because of civil war in the United States. In order to win the support of the recently defeated Clericals, Napoleon offered the Mexican throne to a member of the Catholic Habsburg family; as pawns, poor FERDINAND MAXIMILIAN and unhappy Charlotte were chosen. As the French advanced, in spite of stubborn resistance, Juarez fled the capital but continued to fight the invaders and unpatriotic natives. Finally, the aggressions of Prussia, the unpopularity in France of Napoleon's Mexican venture, and the triumph of Federalism over sectionalism in the United States constituted the greatest factors in favor of constitutional Federalism in Mexico. Napoleon was obliged to withdraw his troops from Mexico, and Maximilian was betrayed, captured, and executed in 1867. Federalism definitely triumphed over its foes in 1867 but failed to pacify Mexico. Despite his past record, Juarez was charged with unconstitutional procedure and dictatorial ambitions and José PORFIRIO DIAZ unsuccessfully rebelled against him. Four years after Juarez's death in 1872, Diaz led a successful revolution against President Lerdo de Tejada.

The advent of Diaz to power, which he exercised almost continually until 1911, inaugurated a new era for Mexico. Political stability was substituted for disorders and kaleidoscopic political changes. Foreign capital was encouraged, commerce and industry were favored, and Mexico's foreign trade doubled and quadrupled. Education was promoted, but chiefly in the urban centers. On the other hand, the unfortunate land policies of Diaz after 1890 resulted in more than 10,000,000 persons losing prescriptive rights to theretofore inalienable communal lands of free villages and becoming peons on the *haciendas* which absorbed the erstwhile village lands. In short, the masses by 1910 were in a state of greater degradation than ever before. Under such conditions a great socio-economic upheaval was inevitable.

The Revolution. FRANCISCO MADERO, preaching both political and agrarian reform, swept Diaz into exile in 1911. Not obtaining real agrarian reforms, he lost the support of the masses and fell an easy victim in 1913 to a Conservative counter-movement, headed by VICTORIANO HUERTA. The Liberals opposed Huerta and, after a year of opposition from them from within and from President Wilson from without, Huerta followed Diaz into exile. Peace and a constructive Liberal program for Mexico were still delayed, due to a civil war among the Liberal leaders. Sentiment crystallized in favor of VENUSTIANO CARRANZA after he had issued in Jan. 1915, a provisional agrarian decree, the first constructive act of the revolution. Carranza not only prevailed over his rivals but late in 1915 was recognized by the United States and associated American Governments. Piqued at the success of his rival, FRANCISCO VILLA deliberately at-

tempted to involve Carranza in complications with the United States; incidents in this attempt were the Villa raid on Columbus, New Mexico, and the unsuccessful Pershing punitive expedition into Mexico in 1916-17.

Meanwhile a constituent assembly at Queretaro engaged in drafting a new constitution. By it Carranza's provisional agrarian decree, which embodied the prime aim of the revolutionists, was constitutionalized. Also the less urgent aims of the revolution, which, by then, had crystallized, namely, nationalization of sub-soil deposits, limiting of agricultural land which foreigners might own, and religious, educational, labor and other social reforms, were embodied in the constitution.

Carranza's mission had been to make possible the crystallization of the aims of the revolution and their incorporation in the constitution. Because he did little to make effective these constitutional provisions he was overthrown in 1920. The peaceful period that has since followed has been the result of the effective realization of the revolutionary aims, beginning with the agrarian enabling acts of the Obregon (*see* OBREGON, ALVARADO) administration. In brief, since 1920, agrarian reforms have resulted in approximately two-thirds of the crop acreage of Mexico passing, as restored or donated village communal land, into the possession of over 6,000,000 of the prerevolution landless masses. Also, despite the energetic protests of the United States Government over a period of 10 years, the nationalization of petroleum deposits has been effected in accordance with the constitution and the decisions of Mexico's highest tribunal of justice. Likewise, in spite of vigorous objections from the United States, Mexican alien land legislation has been accepted by aliens in Mexico. A Church and State conflict, arising during the administration of PLUTARCO CALLES over constitutional provisions which bear very heavily upon the clergy, was adjusted by a compromise in 1929 which favors chiefly the contention of the State while allowing hollow concessions to the Church. A unique and beneficent system of rural education is meeting with considerable success. Finally, labor legislation, passed in 1931, protects, favors and safeguards Mexican labor to an extraordinary degree. With Mexico's chief external and internal problems settled, or in the process of settlement, since 1920, the problem in 1931 became how to recover from the effects of the general economic depression which in Mexico have been especially severe.

C. W. H.

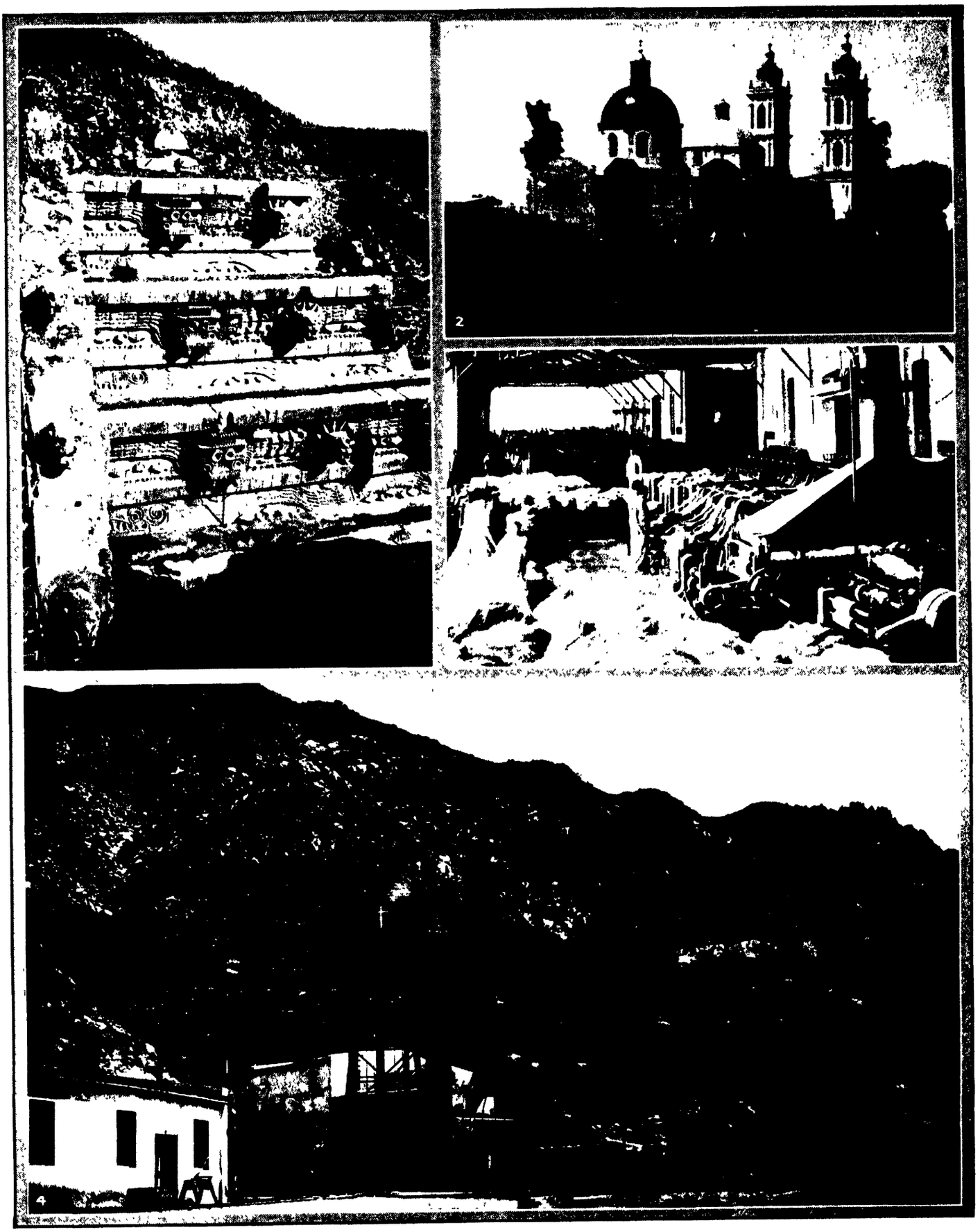
BIBLIOGRAPHY.—Lucas Alamán, *Historia de Mexico*, 5 vols., 1849-52; H. H. Bancroft, *History of Mexico, 1519-1887*, 6 vols., 1883-88; L. Pérez Verdía, *Compendio de la historia Mexicana*, 1911; H. I. Priestley, *The Mexican Nation, A History*, 1923.

MEXICO, a state of the republic of Mexico, situated in the southern part of the great plateau of the country, and one of the smallest but most progressive of the states. Its surface is broken by two mountain ranges which traverse it from east to west, with fertile valleys lying in between. It has an area of 8,262 sq. mi., and a mean elevation of more than 8,000 ft. above sea level. A part of the state was at one time a vast lake, and it is still dotted with small salt lakes and swamps. Because of the high altitude the climate is cool, and in the higher regions, is unpleasantly cold. The most important river is the LERMA, which rises in the state. Among the varied products of the state are the luscious blackberries grown in the famous Toluca Valley, and the maguey plant from which *pulque,* an intoxicant, is made. Another industry is the breeding of bulls for the bull fights of Mexico. The capital is Toluca, and other cities are Lerma, Tenango, Tlatayla and the celebrated mining town of El Oro. Pop. 1921, 884,617; 1930, 978,412.

MEXICO, a city in northeastern Missouri, the county seat of Audrain Co., situated 110 mi. northwest of St. Louis. Bus lines and two railroads serve the city. The chief crops of the region are grain, cowpeas and soy beans. Live stock and saddle horses are also raised. There are large fire clay fields in the vicinity, and the chief local industry is brick making. Gen. U. S. Grant held his first command here during the Civil War. The city was in the position of border line territory between the Union and Confederate factions, and the scene of much fighting. It was settled in 1837; incorporated as a city in 1855. It is the seat of Hardin Junior College and Missouri Military Academy. Pop. 1920, 6,013; 1930, 8,290.

MEXICO, GULF OF, an arm of the Atlantic ocean, situated along the southeastern margin of North America. It is bounded on the north by the United States, on the west by Mexico, and on the east the peninsulas of Florida and Yucatan partly enclose its waters. A line drawn from Cape Catouche in Yucatan to Cape San Antonio, Cuba, separates it from the Caribbean sea; and a line following the 83rd meridian from Cuba northward to the latitude of the Dry Tortugas and eastward through the shoals to Key West divides it from Florida Strait. Within these limits its area is approximately 600,000 sq. mi. Its greatest depth is 12,500 ft., the average depth 4,880 ft. Along its continental coast the Bay of Campeche is the only large indentation, but numerous small inlets and hundreds of lagoons, enclosed behind sand bars, give some relief to the shore line. Owing to the low coastal plain and the very gradual slope of the continental shelf off-shore, the gulf has few good harbors. The best include Vera Cruz, Galveston, Mobile, Tampa and Pensacola. Its chief tributaries are the Mississippi, Rio Grande, Brazos, Sabine, Mobile and Apalachicola rivers. The Gulf Stream enters it by the south channel, circles around the basin and emerges through the Strait of Florida.

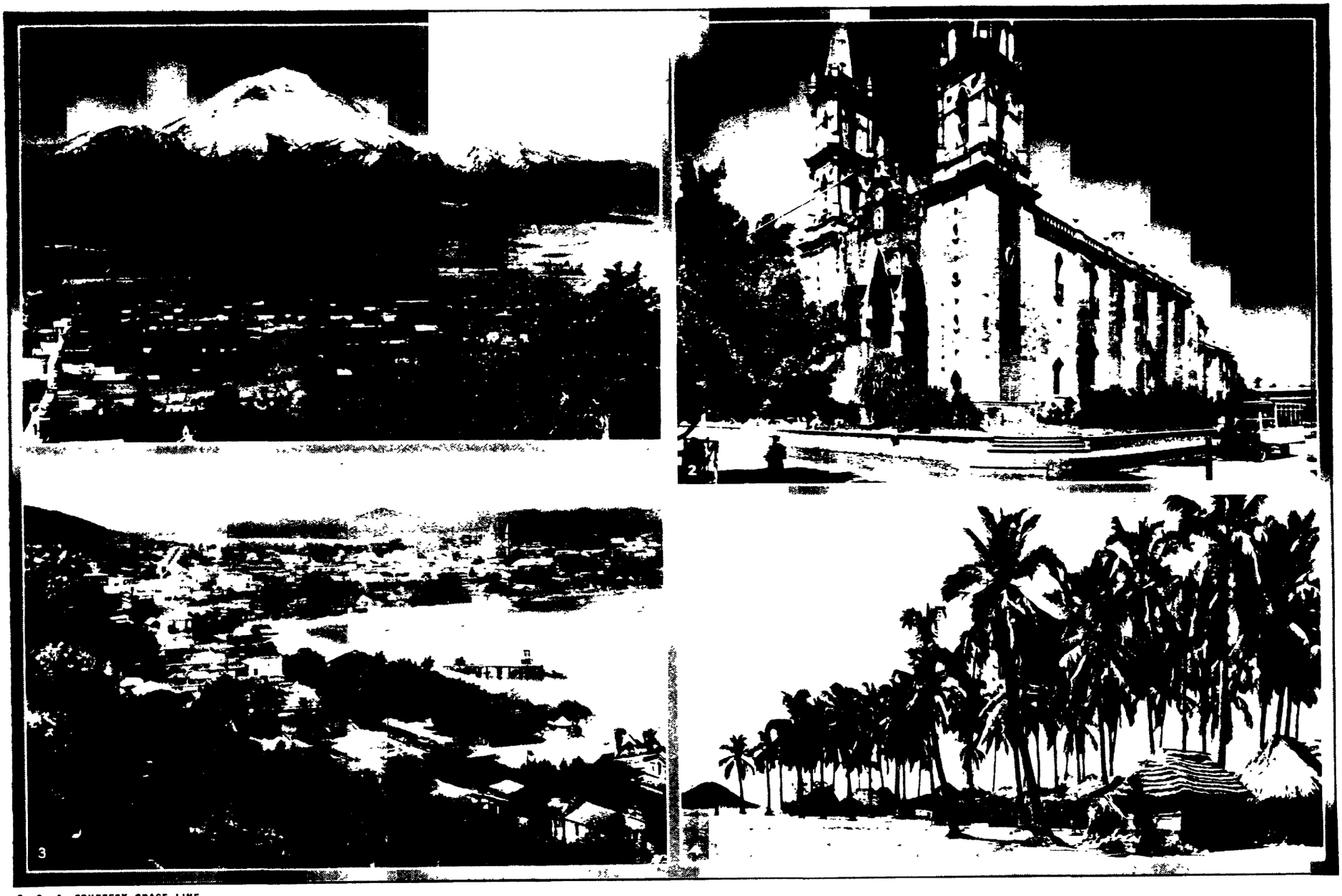
MEXICO CITY, capital of the United States of Mexico (*Estados unidos de Mejico*), forming within a radius of two Spanish miles the Federal District directly administered by the Federal Government. The city is situated almost in the center of the Valley of Tenochtitlan or Mexico, in the great plateau 7,415 feet above sea level. The climate is mild, ranging in temperature from 53° F. in winter to 64° F. in sum-



COURTESY CONSULATE GENERAL OF MEXICO.

ANCIENT AND MODERN MEXICO

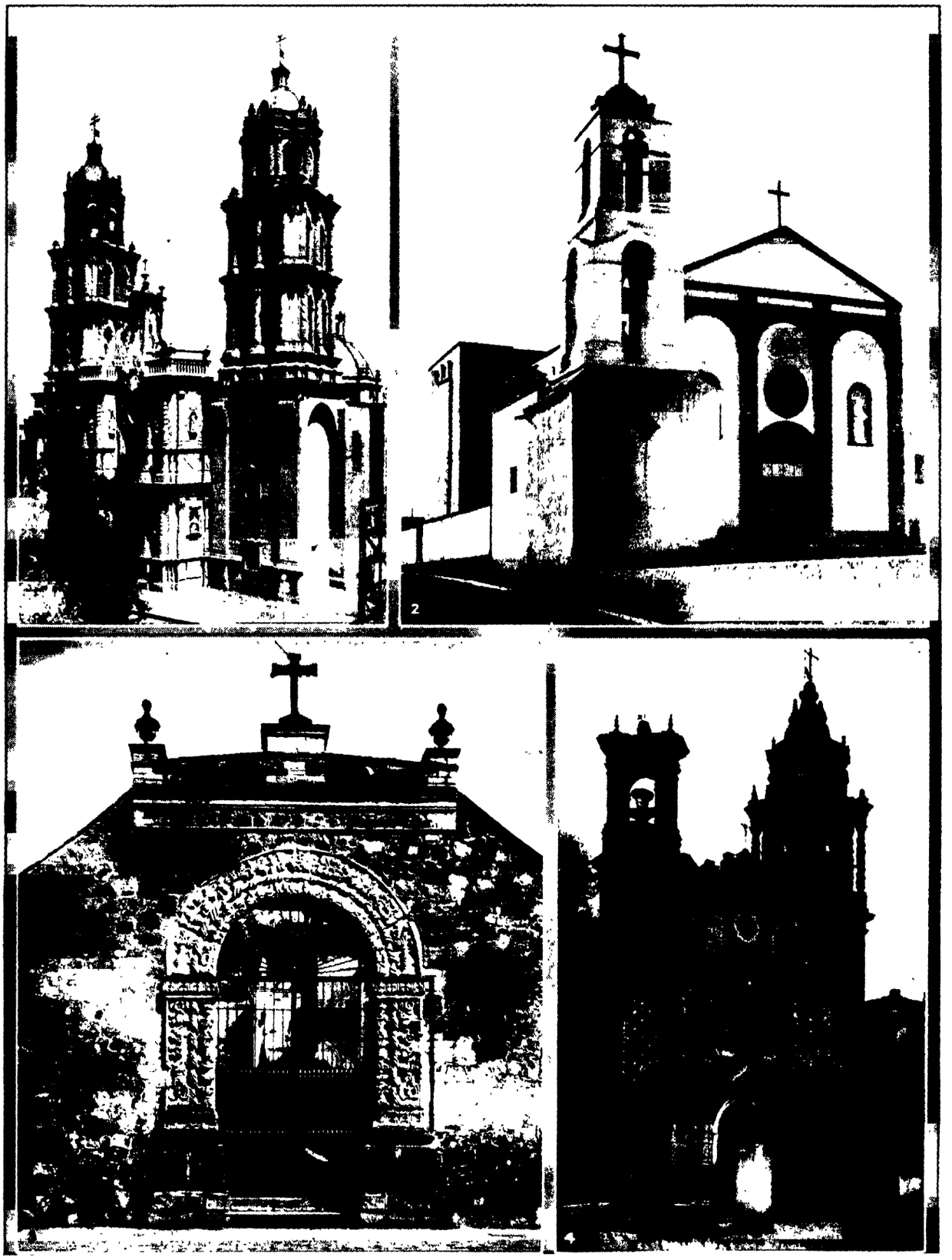
1. Detail of the decoration of the temple of Quetzalcoatl, one of the ruins of the village of San Juan Teotihuacán, near Mexico City. **2.** Famous pyramid of Cholula, Puebla State, topped by a church built on the ruins of an Aztec temple. **3.** Interior of a hemp factory. **4.** Cable station at Concepcion del Oro, Zacatecas State.



2. 3. 4. COURTESY GRACE LINE

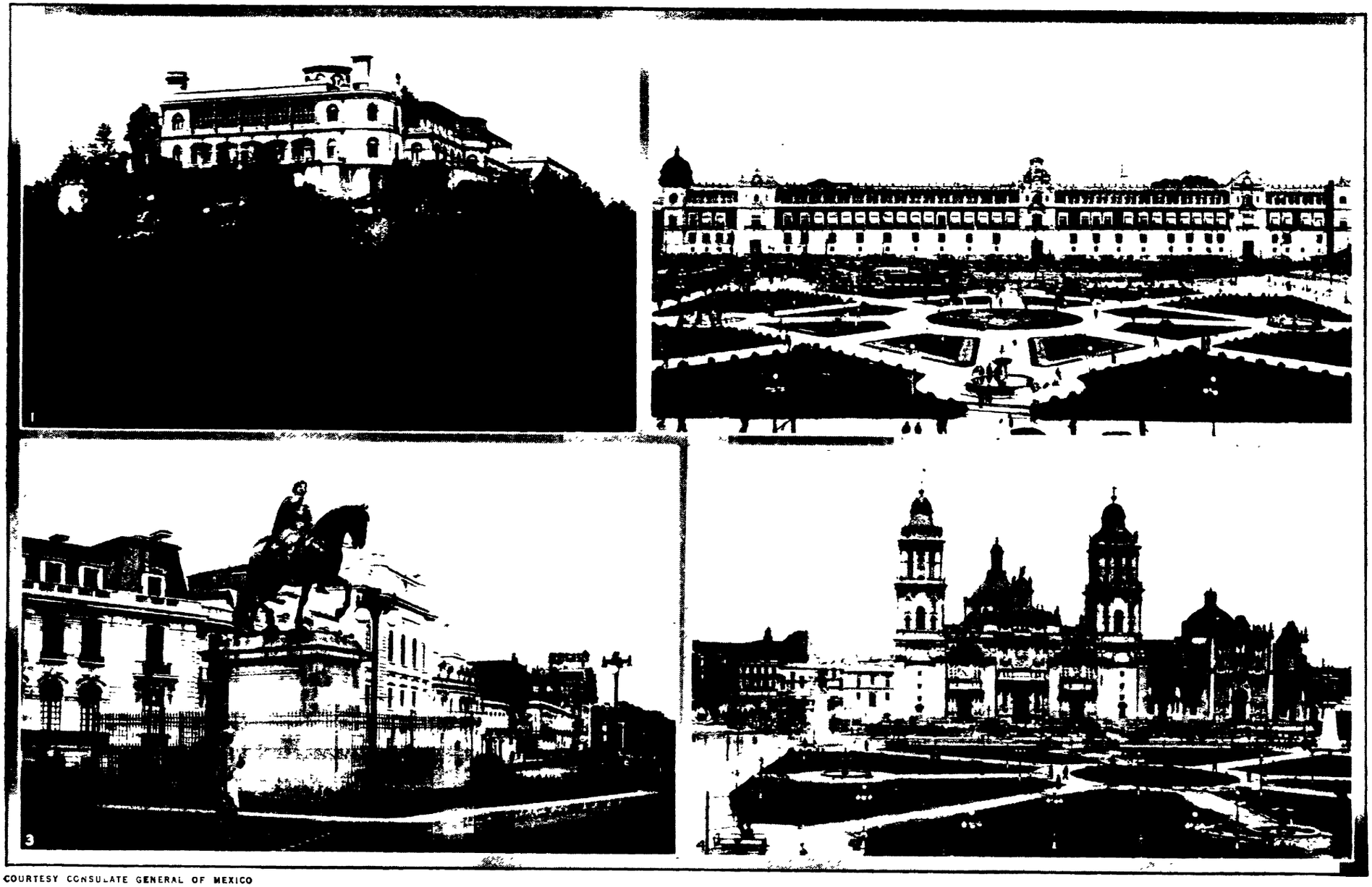
POPOCATEPETL AND THE CITY OF MAZATLÁN, MEXICO

1. Popocatepetl, the great volcano of Mexico. Towering 10,300 feet into the air, its lava-incrusted crater dominates Mexico City and all surrounding territory.
2. Cathedral of Mazatlán, built 1875-90. 3. Bird's-eye view of the beach and city of Mazatlán in the State of Sinaloa. 4. Primitive Indian village on the outskirts of the city.



OLD MEXICAN CHURCHES

1. View of the Cathedral, San Luis Potosí. **2.** Mission Nuestra Señora de Guadalupe, Ciudad Juarez, built in 1659 by Spanish priests with Indian labor. **3.** Entrance to the yard of the Church of San Juan Bautista, Coyoacán, showing Aztec influence. **4.** Mexican colonial architecture of San Francisco Acatepec, near Puebla.



COURTESY CONSULATE GENERAL OF MEXICO

HISTORICAL LANDMARKS OF MEXICO CITY

1. Chapultepec Castle, summer palace of the President of Mexico, crowning the heights 200 ft. above the capital city. **2.** The National Palace, occupying an entire city block. Above the central doorway hangs the Liberty Bell of Mexico, first rung Sept. 15, 1810. **3.** Statue of Charles IV of Spain, the work of Manuel Tolsa, the first important bronze statue cast in America. **4.** Plaza de la Constitution, with the Cathedral of Mexico City, 1573-1667, in the background.

MEXICO

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sa 767,198 sq.m.
p.... 16,527,766

PRINCIPAL CITIES

ıcluding Figures m Latest Popu- lon Estimates)

p.—Thousands

Acambaro M 14
Aguascalientes L 12
Ameca . M 11
Autlán M 10
Campeche M 23
Chihuahua E 9
Ciudad Camargo J 10
Ciudad Guzmán N 11
Ciudad Juárez . . . C 9
Ciudad Victoria J 15
Colima N 11
Comitan P 21
Cordoba N 17
Cuernavaca N 15
Culiacán I 8
Durango J 10
El Oro . . M 14
Gómez Palacio H 11
Guadalajara M 11
Guanajuato L 13
Guaymas F 5
Hermosillo E 5
Iguala O 15
Irapuato . . M 13
Izucar N 16
Jalapa N 17
Jerez K 12
Juchitán P 19
LaBarca M 12
Lagos L 13
LaPaz I 6
LaPiedad M 12
León L 13
Linares I 15
Matamora H 16
Matehuala J 14
Manzatlán J 9
Mérida L 23
Mexicali A 2
9 Mexico N 15
Monclova G 13
Monterrey H 14
Morelia M 13
Nogales C 5
Nuevo Laredo G 15
Oaxaca P 17
Orizaba N 17
Parbuca M 15
Parral, Hidalgo del . . G 9
Patzcuaro N 13
Penjamo M 13
Piedras Negras E 14
Progreso L 13
Puebla N 16
Puruándiro M 13
Queretaro M 14
Rio Verde L 14
Rosario K 9
Salamanca M 13
Saltillo H 13
Salvatierra M 14
San Andrés Tuxtla O 18
San Cristobal Las Casas P 21
San Luis Potosí . . K 13
San Miguel M 14
San Pedro H 12
Silao L 13
Tacubaya . O 2
Tampico K 16
Tapachula Q 21
Tehuacan O 17
Tehuantepec P 19
Tescaltichel L 12
Tepic L 10
Tezlutlan M 17
Tlcul L 23
Tlaxlaco . . P 16
Toluca N 15
Torreon . . H 11
Tuxpan . . . L 16
Tuxtla Gutierrez P 20
Uruapan . N 13
Veracruz N 18
Villahermosa O 21
Zacatecas . K 12
Zamora . . . M 12



mer. The valley was drained by a canal about 6 mi. long, completed 1894, which greatly improved the health of the population. There are two large aqueducts, a sewage system, gas and electric light.

Streets, Squares and Buildings. The Plaza de la Constitucion or Plaza Major, a large parallelogram, is the finest. On the north side stands the cathedral, on the site of the great Aztec temple, built in Spanish-American Baroque style, 1573-1667, with two high towers and a fine dome and many treasures and paintings of great Spanish masters in the interior. On the east side of the square is the large and imposing Palacio Nacional, to the south the Palacio Municipal and on the west a row of fine buildings with arcades and colonnades, among them the palace of the Cortés family. Southeast of the Plaza Major is the market place, Plazuela del Volador with the university building. The most popular place for pedestrians is the Alameda, in the northwest of the city, through the Avenida Juarez and the Paseo de la Reforma, the favorite drive, leading to Chapultepec and ornamented by monuments of Charles IV, Columbus, Guatemozin, Juarez and others. Besides the cathedral, the most noteworthy ecclesiastical buildings are the monastery of San Francisco with seven churches and chapels, the great cloister of the Dominicans, later used as a prison, the La Profesa Church which formerly belonged to the Jesuits, and the handsome cloister La Merced. There are also six Protestant churches. Besides being the residence of the president and of the Federal Government, the city is also the seat of the governor of the state of Mexico and of an archbishop.

Educational Institutions. The university was founded in 1553 and there are also a law school, two medical schools, an advanced German school, an agricultural and a commercial school, a technical and a trade school and two teachers' seminaries. There is an academy of art with a picture gallery and a conservatory of music, National Library with 200,000 volumes and many other libraries. Other important institutions are the National Museum with Mexican antiques, including an Aztec calendar stone and the famous Aztec sacrificial stone, the National Observatory in Tacubaya, the Geological Institute and several learned societies for natural sciences, history, geography and literature. Entertainment is provided by several theaters and bullrings.

Charitable institutions embrace hospitals, insane asylums, institutions for the deaf, dumb and blind, orphan asylums, a poor house and a lying-in hospital.

Manufactures and Transportation. Industrial plants produce machines, paper, earthenware, gold and silverware, cotton and woolen goods, furniture, soap, glass and chocolate. Trade is facilitated by many banks, mostly foreign, trade associations, numerous railways and two canals, dating back to the Aztec times, which unite Mexico City with Lakes Tezcoco and Chaco and provide the capital with vegetables, fruit and flowers. Electric railways connect with the suburbs, including Chapultepec nearby on a crag occupying the site of a former palace of Montezuma. The new palace was built 1783-85 and is now the residence of the president and seat of the national military academy. Near the village Xochimilco are the *chinampas,* curious floating gardens, rafts covered with earth on which vegetables and flowers are grown. Less than 5 mi. to the north of the city is Guadaloupe-Hidalgo, with a splendid church, built 1709, and a miraculous brown statue of the Virgin. There Feb. 2, 1848, the treaty of peace after the Mexican War was signed, transferring to the United States Mexico's vast northern territories.

The population is one-half Creoles, one-fourth Indians, the rest half-breeds and about 25,000 foreigners, Americans, British, French, Germans and Spanish. Pop. 1921, 615,367; 1930, 968,443.

MEXICO CITY, CATHEDRAL OF, one of the largest cathedrals in America, is located on the Plaza de la Constitucion of Mexico City. The site chosen was previously occupied by an imposing temple built by the Aztecs for the worship of their chief god, Huitzilopochtli. The Cathedral of Mexico City, although begun in the 16th century, was not completed until well into the 19th century. It rises from a rectangular foundation over 400 ft. long and over 200 ft. wide. The cathedral is in the Spanish-American Baroque style. At one side is the sacristy, treated as a separate church, with an interesting Baroque front.

MEYER, CONRAD FERDINAND (1825-96), Swiss poet and novelist, was born at Zürich, Oct. 11, 1825. He was over 40 when he began to publish his works, which were notable for elegance and scholarliness. His poems ran into numerous editions and include *Balladen,* 1867, *Romanzen und Bilder,* 1870, *Huttens letzte Tage,* 1871, and *Engelberg,* 1873. Among his novels are *Jürg Jenatsch,* 1876, and *Der Heilige,* 1880; he also wrote short stories. Meyer died near Zürich, Nov. 28, 1896.

MEYER, EDUARD (1855-1930), German historian, was born at Hamburg on Jan. 25, 1855. He was educated at Bonn and at Leipzig, where he was made professor in ancient history in 1879. Meyer became professor of ancient history at Breslau in 1885, at Halle in 1889, and at Berlin in 1902. He made several trips to America, lecturing at Harvard in 1927. His principal work is the *Geschichte des Altertums* (5 vols., 1884-1902), which earned him a place among the foremost modern writers of ancient history. To his historical investigations, Meyer brought a keen and critical mind, a first-hand acquaintance with archaeological records, and a sound knowledge of comparative philology, which enabled him to trace the relationships between civilizations of antiquity. His numerous other works include *Geschichte des Alten Aegyptens* (1887); *Forschungen zur Alten Geschichte* (1892-99); *Zur Theorie und Methodik der Geschichte* (1902); and *Ursprung und Anfange des Christentums* (3 vols., 1921-23). Meyer died at Berlin, Aug. 31, 1930.

MEYER, VICTOR (1848-1897), German chemist, was born in Berlin on Sept. 8, 1848. He studied, first at Heidelberg, under Bunsen and Kirchhoff, later

with Helmholtz, and with Bayer at Berlin. After a brief stay at Stuttgart, he succeeded J. Wislicenus at Zürich, went to Göttingen in 1885 and 4 years later took Bunsen's place at Heidelberg. His early work was mainly in organic chemistry, where, among others, he studied the structure of benzene, and the valence and power of combination of carbon, discovered the aliphatic nitrocompounds, and later the aldoximes and ketoximes, and showed their stereochemical structure. He devised a new method of determining vapor densities, and molecular weights, through which he afterwards came to study the behavior of gas vapors at high temperatures. In 1883 he discovered the important heterocyclic substance thiophen. He was awarded the Davy medal in 1891. He died, probably by suicide, on Aug. 8, 1897.

MEYERBEER, GIACOMO (1791-1864), German-Jewish music composer, was born at Berlin, Sept. 5, 1791. His original name was Jakob Liebmann Beer which he abandoned in deference to the terms of the will of a wealthy relative. The pupil of Lauska, Clementi, Zelter, and Anselm Weber, he showed early promise as a pianist, and at the age of 22 had already composed two operas. Imitating ROSSINI, he produced several operas in the Italian manner. Of these *Il Crociato in Egitto* was the most successful. Under French influence he composed four operas, *Robert le Diable, Les Huguenots, Le Prophète* and *L'Africaine,* all of which became generally popular throughout Europe. In 1842 he was appointed General Music Director in Berlin by Friedrich Wilhelm IV, and while incumbent of that post produced WAGNER's *Rienzi* (although Wagner denounced Meyerbeer's musicianship) and CARL WEBER's *Euryanthe.* His music is prone to sensationalism, but he was an able craftsman whose lively sense of the theater was abetted by his selection of Eugène Scribe for a librettist. Besides the operas mentioned he composed *L'Etoile du Nord, Le Pardon de Ploermel,* and an overture and incidental music for the drama *Struensee.* He died at Paris, May 2, 1864.

MEZZO-RELIEVO, a term applied to relief sculpture in which the design is not so detached from the background as in alto-relievo or high-relief, yet more raised than in basso-relievo or bas-relief. Low-relief is the term now commonly used to cover both mezzo-relievo and bas-relief.

MEZZOTINT, a method of producing engravings in delicately modulated tones, made up of microscopic black dots. The copper-plate is first prepared to print a uniform black, by roughening it with a fine-toothed chisel called a "rocker." This throws up a burr which, absorbing considerable ink, creates the rich, velvety quality characterizing the mezzotint. After smoothing the rocked plate with lampblack and tallow, to receive the design, the artist puts in his lights. Where deep shadow is wanted, the burr is left untouched. In middle tones it is partially leveled with a scraper so that it will hold less ink, and in high lights completely removed. The surface is then burnished.

Invented by a German, Ludwig von Siegen, about 1642, mezzotint reached its height in the 18th century, with the rise of the great British portrait-painters. Among brilliant mezzotinters who reproduced the work of SIR JOSHUA REYNOLDS and his contemporaries were John Raphael Smith (1752-1812), J. MacArdell (d. 1765), Valentine Green (1739-1813), S. W. Reynolds and Charles Turner. The art was introduced into the United States by Peter Pelham, of London, in 1727. Another Englishman, John Sartain (1808-97), practised it in Philadelphia, Pa., during the period 1830-70. Mezzotinting was essayed as an original art, first by J. M. W. TURNER, and later by Sir Hubert Herkomer (1849-1914), Sir Francis S. Haden (1818-1914), G. H. Smillie, Alphonse Legros (1837-1911), and Sir Frank Short (1857-).

MIAMI, a North American Indian tribe belonging to the Algonkian linguistic stock. In historic times they were reported as living first near Green Bay, Wis., later at the headwaters of the Fox River with the Mascoutens, at the south end of Lake Michigan and on the Kalamazoo River, Mich.; but the evidence points to the fact that the Miami around Green Bay and the vicinity were but part of the tribe and that they were fairly well distributed throughout northeastern Illinois and northern Indiana, and later in northwestern Ohio. Their migration during historic times appears to have been southeastward. The Miami were agriculturists, raised maize, dressed mainly in deerskins, practised tattooing, hunted the buffalo by setting fire in a kind of surround; they wove hair into bags, and made rush mats which were used to cover their dome-shaped houses. The Miami have always been confused or counted with the Wea and Piankashaw, and the actual number still living, in Oklahoma, where they were removed, and in Indiana, is unknown, but is estimated at merely several hundred with very few full bloods.

MIAMI, a city in Gila Co., in southeastern Arizona, situated 7 mi. west of Globe in the Globe-Miami copper mining district. It is served by the Southern Pacific Railroad, and has bus and truck line connections over the Central Arizona Highway and the Apache Trail, the route to the Roosevelt Dam. Many valuable minerals besides copper are found in this region. Cattle ranching and farming are important interests in the vicinity. An Indian reservation, the COOLIDGE DAM and Crook National Forest are near by. The city was incorporated in 1918. Pop. 1920, 6,689; 1930, 7,693.

MIAMI, a port on the southeastern coast of Florida, the county seat of Dade Co., situated on Biscayne Bay at the mouth of the Miami River. Bus lines, airplanes, steamships and two railroads serve the city. Miami is a popular winter resort with luxurious hotels, splendid water sports and other attractions. The United States Government has deepened the harbor and channel. Miami is in a fertile region, producing fruit, vegetables and poultry. The city is a shipping center and has various manufactures, including furniture, clothing, automobile parts, canned goods and



COURTESY METROPOLITAN MUSEUM OF ART

ENGLISH MEZZOTINT ENGRAVING

1. "Lady and Children Relieving a Cottager," by William R. Bigg. Engraving by John Raphael Smith (1752-1812).
2. "The Mill Stream," by John Constable. Engraving by David Lucas (1802-81).

cigars. In 1929 the factory output was approximately $12,000,000; the retail trade amounted to $71,876,576. Miami has been justly called "the magic city." It was a small Indian trading post in 1896 when Henry M. Flagler extended the Florida East Coast Railroad and built the Royal Palm Hotel. The city was incorporated in the same year with a population of 260 inhabitants. By 1910 it had increased to 5,471 people. Miami was the Mecca of fortune seekers during the real estate boom of 1925-26. In Sept., 1926, the city, like other coastal localities, was badly damaged by a West Indian hurricane. Ft. Dallas, built in 1836 as a defense against the Seminole Indians, stands as a historical monument within the city. Miami is the seat of the University of Miami. It is the northern terminus of Pan-American Airways. Pop. 1920, 29,571; 1930, 110,637.

MIAMI, a city and the county seat of Ottawa Co. situated in northeastern Oklahoma on the Neosho River about 116 mi. northeast of Tulsa. Two railroads, an electric railway and bus lines serve the city. The city is a market for the crops of the region, wheat, corn and legumes, and also the urban center of the lead and zinc mines of the state. There are various industries, including meat packing and milk products manufacture. The Ozark Mountains which afford good fishing and other recreations are close at hand. Miami was founded in 1891. Pop. 1920, 6,802; 1930, 8,064.

MIAMI BEACH, a city in Dade Co., on the southeastern coast of Florida, on the Atlantic Ocean, three mi. east of Miami. The city is a winter resort and residential community, with a winter population of 30,000. The permanent population is rapidly increasing on account of the desirable living conditions. Miami Beach was incorporated in 1915. Pop. 1920, 644; 1930, 6,494.

MIAMISBURG, a city in Montgomery Co., southwestern Ohio, situated on the Miami River, 11 mi. southwest of Dayton. Bus lines and three railroads afford transportation. The chief crop of the region is tobacco. Miamisburg produces flour, paper and other commodities. Northeast of the city is Bryan State Park, which is being developed as a forest arboretum. An Indian mound is located ½ mi. southeast. The city suffered from floods in 1913. Pop. 1920, 4,383; 1930, 5,518.

MIAMI UNIVERSITY, at Oxford, O., a coeducational institution founded in 1809 and supported by the state. It was opened in 1824 as a liberal arts college. A State Teachers College was established as part of the university in 1902, and a Bureau of Special Education for training teachers of sub-normal children in 1920. The library contains 117,253 volumes. In 1931-32 there were 2,336 students, and a faculty of 179 headed by Pres. Alfred H. Upham.

MIANA BUG, the common name for a tick (*Argas persicus*) often found in houses in Persia and India. Its bite is very painful, but apparently not as dangerous as was once believed. Travelers' tales, in the past, told of convulsions, delirium and death having followed the bite of the Miana bug. These stories, however, have been discredited by scientific investigation.

MICA, the name of a group of minerals showing similar properties and similar chemical composition. It is popularly applied to one member of the group, Muscovite. All of the group are characterized by a great perfection of Cleavage in one direction which permits them to be split into thin, tough and elastic plates. They crystallize in flat, six-sided tablets which seem to belong in the Hexagonal System, but which are really monoclinic. The micas fall naturally into two groups, the light-colored variety, embracing the colorless muscovite and allied forms, and the dark-colored micas, including the black Biotite and its relatives. All are hydrous silicates of aluminum with one or more of potassium, magnesium, iron and lithium. In rarer forms other elements also occur.

Muscovite is colorless or gray, sometimes greenish or light brown. It is a potassium mica. The pink or lilac lepidolite contains lithium. Phlogopite, a magnesium mica, is brown. The iron-magnesium mica, biotite, is brown to black, and the iron mica, lepidomelane, is greenish black.

The most resistant to alteration is muscovite, but it may eventually weather to Clay, as does its other form, Sericite. Biotite goes to Chlorite, a green, micaceous mineral without elasticity. Others weather to secondary minerals corresponding to their compositions.

The common muscovite and biotite are abundant constituents of many Igneous and Metamorphic Rocks, and some sedimentary ones, especially Sandstones. Biotite is less common than muscovite in the sediments, however. Commercial production of muscovite usually comes from Pegmatites.

Mica, mostly muscovite, is used for insulating purposes in electrical equipment, for heat insulation compounds, in glazing, patent roofings, as a lubricant and for decorative purposes, such as artificial snow. India, Canada and the United States are the important producers. *See also* Monoclinic System; Slate; Petrology; Weathering. S. F. K.

MICAH, or MICHAH, in Biblical account one of the Hebrew prophets, author of the Biblical book by that name and contemporary of the Prophet Isaiah. The period of his activity was approximately from 740 B.C. to 590 B.C. Micah came from a border city of the lowland Philistine plains and his passionate condemnations of the corruptions of society strike a note of high ethical import. They assisted in the reform movement resulting in the Book of Deuteronomy.

MICAH, BOOK OF, the sixth of the minor prophetical books of the Old Testament, derives its name from a Hebrew prophet, Micah of Moresheth. Many modern scholars believe the diverse style of the book points to more than one author, and that only in part does it come from Micah. Its intense religious feeling and high ethical ideals give the book

a unique place. The passage in Chapter 6:8, "What doth the Lord require of thee, but to do justly, and to love mercy, and to walk humbly with thy God," as a brief expression of the essence of true worship, has never been surpassed.

MICHAEL (Hebrew for *like unto God*), a Biblical name synonymous with Micah, prime archangel of those who surround the throne of God, and the guardian angel of Israel. He holds an important position in the occult teachings of the Jews. As early as the 9th century, Michaelmas on St. Michael's and All Angels' Day was celebrated on Sept. 29 by the Western Church, and on Nov. 8 by the Greek Church.

MICHEL, CLÉMENCE LOUISE (1830-1905), French anarchist, daughter of a serving maid, was born at the Chateau Vroncourt, Haute Marne, May 29, 1830. She was well educated and went to Paris to teach in Montmartre. While there she adopted revolutionary views and allied herself with the Communist Theodore Ferre. In 1871, under the name of La Vierge Rouge de Montmartre, Clemence Michel was sentenced to be deported. After the amnesty in 1880 again imprisoned for political reasons, she was pardoned in 1883. She died in Marseilles Jan. 20, 1905.

MICHELANGELO (Michelagniolo Buonarroti) (1475-1564), one of the greatest of all artists, some say the greatest, was born at Caprese, Mar. 6, 1475. He came of an old Florentine family of good stock but slender wealth. The father, Ludovico, gained a meager living in minor offices of state which he owed to the favor of the Medici. As the mother was not robust the child was nursed by a marble cutter's wife at Settignane. He early became a favorite of Lorenzo the Magnificent who about 1490 invited him to become a resident of his palace.

Michelangelo is equally famous for sculpture and painting. In his case, it was the mighty spirit that inflamed and gave eloquence to all that he did. Even the few sonnets he wrote, although he was not a writing man, have a beauty that made them classic. The conditions of the artist's life were hard and the times were tumultuous and uncertain, and the many difficulties that stood in the way of genius had, no doubt, much to do with giving Buonarroti a somber, morose cast of mind. There was something god-like as well as demonic in his character, and as he was impetuous and strong-willed he had many notable clashes with his enemies and especially with his patrons. Yet it was not for himself he fought but for his work. Throughout life he was generous and he was the chief support of his family which in time became dependent upon him.

Michelangelo's first great sensational success was the carving of a gigantic statue of the boy David out of an immense and awkwardly shaped rock that had been the despair of sculptors for 40 years or more. In spite of the odd shape of the stone that was given him, Michelangelo's science and genius enabled him to give an unrestricted and easy strength to the figure, and it is to the credit of his contemporaries that they recognized at once that a masterpiece of art had been created. There are many glowing accounts of the fervor with which the statue was drawn through the streets to its resting place, and it is almost pathetic now to read of the excitement that the new statue caused in the community. The statue is now, for protection, in the Academy, though of course it would look immeasurably better out-of-doors.

In popular opinion his greatest work is the painted ceiling of the Sistine Chapel in the Vatican; but experienced critics hesitate to rank it above his greatest carvings, as both seem equally inspired and touched with genius. Michelangelo entered upon this task with misgivings. He considered himself chiefly a sculptor and had spent months of enthusiastic preparation upon a great tomb commissioned for himself by Pope Julian; but this congenial task had to be abandoned because of Pope Julian's military campaigns. When peace was resumed the artist was asked to paint the ceiling of the Sistine Chapel and he could not refuse. He knew very well that his enemies hoped that the difficulties of the work would prove his undoing; but his boyhood apprenticeship in the atelier of Ghirlandajo stood him in good stead, and after four and a half years of arduous labor the decoration was successfully accomplished. Ever since it has been one of the chief glories of art. In it Michelangelo has painted a fanciful structure rising to enclose nine sections in the middle of the ceiling in which are scenes from the creation. In the vaulting's lower sections are prophets and sibyls, and in the pointed arches the ancestors of Christ. The grandeur and imaginative force of the work are beyond parallel, and in particular the figures of the prophets and sibyls are extraordinarily impressive. Years after, the artist painted the *Last Judgment* for the end wall of the same chapel, and though this is justly celebrated it scarcely has the power of the marvelous ceiling.



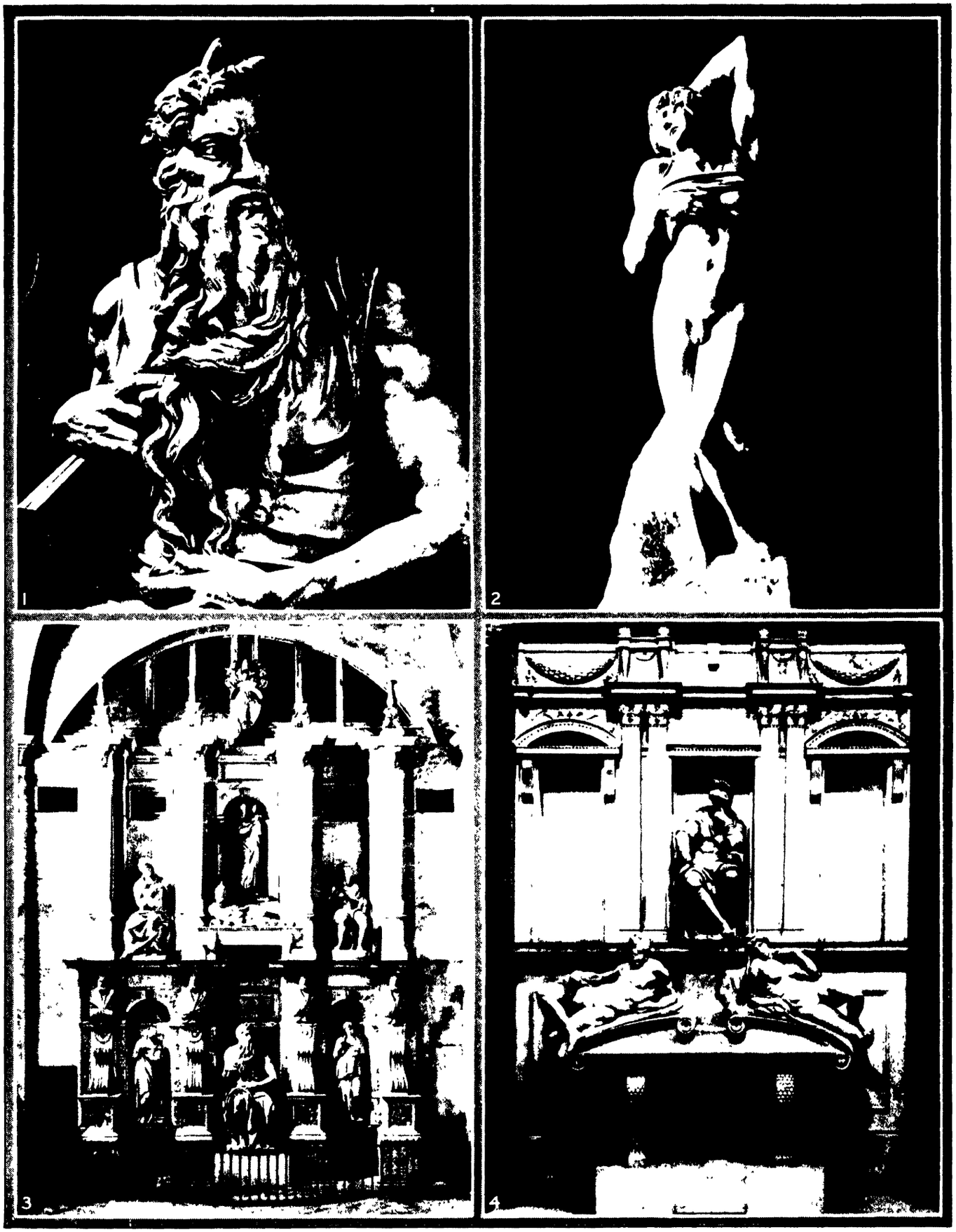
CARTOUCHI BY MICHELANGELO — THE COAT OF ARMS OF THE FARNESE FAMILY

The project for the Julian tomb was resumed at intervals and frequently changed. Finally it became a Medici tomb instead of a Julian tomb, and some of the carvings for it rank among Michelangelo's supreme achievements. Among them are the celebrated *Moses*, the *Lorenzo*, also known as *The Thinker*, and the beautiful reclining figures called *Night* and *Day*. Other famous carvings that ought to be mentioned even in such a curtailed account as this, are *The Slave*, in the Louvre; the *Pieta*, in St. Peter's and the *Christ*. During his later years the artist gave much time, like Leonardo da Vinci, to military engi-



"THE CUMAEAN SIBYL"

Part of the fresco on the ceiling of the Sistine Chapel in the Vatican, Rome, by Michelangelo (1475-1564). This figure is one of the group of Sibyls and Prophets, arranged alternately in spaces below the main fresco.



MASTERPIECES OF SCULPTURE BY MICHELANGELO

1. Statue of Moses in San Pietro in Vincoli, Rome. **2.** "The Bound Slave," in the Louvre, Paris. **3.** Tomb of Pope Julius II in San Pietro in Vincoli. **4.** Tomb of Lorenzo de' Medici, Florence. Lorenzo is shown in an attitude of meditation, while below him are figures of Evening and Dawn sunk in grief at the loss of the great soldier.

neering and architecture, one of his most successful enterprises being the supports and lower part of the great dome of St. Peter's. He died in 1564, at the age of 90 and was mourned alike by the great and humble of his time. H. McB.

MICHELEN. *See* MALINES.

MICHELET, JULES (1798-1874), French historian, was born in Paris on Aug. 21, 1798. His father was a printer and as a boy Michelet helped work the presses in the humble little shop. But his remarkable intellectual powers were recognized by his teachers and Michelet ultimately became a professor, producing historical works in his leisure time. His *Histoire de France,* the great work of his life, began to appear in 1833, and by 1846 six volumes had been published. At intervals between these dates Michelet produced other works, some historical and others, such as *L'insecte* and *L'oiseau,* the outcome of his love of nature. His fiery *Histoire de la revolution française* appeared in 1853. He died at Hyères on Feb. 9, 1874.

MICHELSON, ALBERT ABRAHAM (1852-1931), American physicist, was born at Strelno, Germany, Dec. 19, 1852. His parents shortly afterward moved to San Francisco, Calif., where he was graduated from the Naval Academy in 1873. He remained as physics instructor in 1875-79, and in 1880-82 studied at Berlin and Heidelberg universities. In 1883 he became professor of physics at the Case School of Applied Science, Cleveland, Ohio, and, after holding a professorship in 1889-92 at Clark University, he was appointed head of the department of physics at the University of Chicago in 1892. His career was identified with experiments in the field of light and light velocity, which he first measured when at the Naval Academy, and again at Cleveland, with notable results in 1927, 1929 and 1931. His experiments on ether drift done in collaboration with E. W. Morley at Cleveland, and generally known as the MICHELSON-MORLEY EXPERIMENT, may be said to have given the impetus for the theory of RELATIVITY. He used an INTERFEROMETER to measure exactly the value of the standard meter in terms of a constant of nature (the wave-length of light) and used another form of interferometer to make the first direct measure of the diameter of a star. Among his numerous scientific honors and distinctions is the Nobel Prize for physics, awarded him in 1907. He died at Chicago, May 9, 1931.

MICHELSON-MORLEY EXPERIMENT, an experiment, first attempted by A. A. MICHELSON in 1881 and then by Michelson and E. W. Morley in 1887, to detect the motion of the earth through the ether by the effects of such motion on the velocity of light.

The experiment was performed with an INTERFEROMETER, invented by Michelson, by means of which two beams of light are made to travel at right angles to one another. If the apparatus can be placed so that one of the beams travels in the direction of the motion of the earth and the other in a direction perpendicular to this, it can be shown that the time required for the first beam to travel a distance, d, to a mirror and back again will be greater than that required for the second beam to travel the same distance to another mirror by an amount which is a function of $\frac{d v^2}{c^2}$ where c is the velocity of light, and v is the velocity of the earth with respect to the ether. Since the ratio, v/c, is very small, the effect is extremely minute, but it should result in a measurable shift in the interference fringes formed by the two beams upon reuniting. The effect can be doubled by rotating the apparatus through 90°, thus interchanging the two beams of light.

The interferometer, as used by Michelson and Morley, was set up on a heavy slab of stone carried on a large wooden disc floating on mercury, in order to allow a smooth rotation without setting up strains in the apparatus. To increase the effect, the distance traveled by the two interfering beams was made much larger than in the usual interferometer by reflecting each beam back and forth between mirrors several times. In this way the optical path, d, was made about 11 m. which, on the assumption of a fixed ether, should produce a displacement of a 0.4 of a fringe. Readings were taken in sixteen different directions and at different times of the day, the observers moving around with the experiment. The actual displacement of the fringes was less than 1/40 of the amount expected, and it was concluded that "considering the motion of the earth in its orbit only . . . the relative motion of the earth and the ether is probably less than one-sixth of the earth's orbital velocity and certainly less than one-fourth" (less than 7,500 m. per sec.). This result is at variance with other experiments, notably the phenomenon of astronomical aberration.

The failure of the Michelson-Morley experiment to detect any relative motion between the ether and the earth formed the starting point of Einstein's theory of relativity, and the experiment is so important that it has often been repeated. In 1904, Morley and Miller carried out new and refined experiments in Cleveland in a basement room, and, in 1905-06, found an effect 10% of that expected, their apparatus then being located at an elevation of 300 ft. above Lake Erie and being free from obstruction by buildings. In 1921 and in 1925-26 Miller again performed the experiment, this time on Mt. Wilson at an elevation of 6,000 ft. These measurements, thousands in number, have consistently shown a small positive effect, as of a relative motion of the earth and the ether of approximately 10,000 m. per sec., and a motion of the solar system in space with a velocity of upwards of 200,000 m. per sec., towards an apex in the constellation Draco. These results, startling and unexpected, have led many other scientists, mentioned in the references below, to repeat the experiment, using various modifications of the original Michelson set-up. All these later attempts have not detected an effect such as Miller's. The dis-

crepancies between these results and those of Miller have as yet not been satisfactorily explained, and the experiment is being continued in various places.

T. S.

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MICHIGAN, one of the north central states of the United States, popularly called the "Wolverine State." It is situated between 41° 44′ and 47° 30′ N. lat. and 82° 25′ and 90° 31′ W. long. The state is made up of two peninsulas, the smaller northern and the much larger southern peninsula. The northern peninsula is bounded on the north by Lake Superior; on the east by the province of Ontario, Canada, from which it is separated by St. Mary's River, and by Lake Superior and Lake George; on the south by lakes Huron and Michigan and the straits of Mackinac, which separate it from the southern peninsula; and on the south and west by Wisconsin. The southern peninsula is bounded on the north by Lake Michigan, the straits of Mackinac and Lake Huron; on the east by lakes Huron, Erie and St. Clair, and also by the province of Ontario, from which it is separated by the St. Clair and Detroit rivers; on the south by Ohio and Indiana, and on the west by Lake Michigan. The state comprises an area of 57,980 sq. mi., inclusive of 500 sq. mi. of inland water surface and also has jurisdiction over 40,030 sq. mi. in Lakes Superior, Michigan, Huron, St. Clair and Erie. The length of the northern peninsula is 318 mi. from east to west and its breadth is 164 mi. from north to south; the length of the southern peninsula is 277 mi. from north to south and its width is 195 mi. from east to west. In size Michigan ranks twenty-second among the states of the Union.



COURTESY MICHIGAN HISTORICAL COMM.

MICHIGAN STATE SEAL

Surface Features. Michigan lies entirely within the central lowlands of the United States. Its topography conforms to that of the surrounding prairie regions except for the northern peninsula which belongs structurally to the Laurentian Uplands of Canada.

In the northern peninsula ranges of hills border the Lake Michigan shore line, and also that of Lake Superior in Alger County where are found the famous Pictured Rocks. In Marquette County the Huron Mountains rise 1,400 ft. above the lake and along the northwestern shore in Houghton and Keewenaw counties, is the Keewenaw Range which is famous for its output of copper. The Gogebic iron range runs generally northeastward through Gogebic and Ontonagon counties. Between the latter ridge and the lake is a short uplift called the Porcupine Mountains, 2,023 ft. high, which attain the highest altitude in the state. The lowest point, 572 ft., is the level of Lake Erie and the mean elevation of the entire state is 900 ft.

The southern peninsula has a generally regular surface but slightly elevated above the lakes. Its most characteristic features are the curved chains of low hills or terminal moraines created when the continental ice sheet receded slowly from this region. The greater part of the southern peninsula slopes westward and is drained into Lake Michigan by the Manistee, Muskegon, Kalamazoo and St. Joseph rivers.

Climate. Its situation in both the cold and the warm temperature belt would naturally give Michigan a somewhat variable climate, but the presence of the great lakes surrounding it have rendered the climate quite insular in character. The mean annual temperature is 44.6° F., varying from 48.5° F. at Detroit in the south to 41° F. at Marquette in the northern peninsula. The mean annual temperature at Detroit is 24.4° F. for January and 72.1° F. for July, at Marquette 16.3° F. for January and 64.9° F. for July. During the period 1888-1930 the highest temperature recorded in Michigan was 110° F. and the lowest —49° F. The average annual precipitation is likewise fairly uniform with 30.6 in. for the state including 56.8 in. of snow. Average dates for the last killing frosts in spring are April 30 for Detroit and May 13 for Alpena, while those for the first killing frosts in autumn are October 14 at Detroit and September 30 at Alpena, giving an average growing season at these points of 167 and 140 days respectively.

Forests and Parks. With the exception of a few small prairies in the southwestern portion believed to have been cleared by Indians at the advent of the white man, the entire state was a splendid forest of hardwoods and conifers. Oaks, hickory, ash, maple, elm, walnut and other hardwoods thrive in the south and decrease toward the north as white pine, hemlock, cedar, spruce and tamarack become the principal trees. The estimated forest area in 1929 including immature timber and stump land was 14,000,000 acres or less than 40% of the land area. Michigan has an active reforestation plan and in 1930 planted 19,384,259 trees in cooperation with the Federal Government under the Clarke-McNary law. Twelve state forests cover approximately 500,000 acres. These are located in the northern part of the state and practically all of them have been burned and logged over but are being intensively reforested. Two national forests, the Huron and Michigan, had a total net area in June, 1930, of 290,747 acres. A branch forest experimental station is maintained at Ruse. The Brady district of the Michigan National Forest is a Federal game refuge. Eight state game refuges with a total area of 38,400 acres contain deer, bear, grouse, and small fur-bearing animals. Michigan possesses more separate park sites than any other state although others exceed in total acreage. Having had one of the first state parks in the country, Mackinac Island, opened in 1885, Michigan early became interested and now has 70 parks which range from small 12-acre areas

to over 8,000 acres in Harwich Pines State Park and 15,000 acres in the Hanson Military Reserve. The majority are equipped with camping, boating and restaurant facilities in addition to splendid roads and trails. The Department of Conservation has protective and constructive supervision of all state parks, forests and game preserves.

Minerals and Mining. Although possessing large and varied resources, Michigan owes its great importance in mineral production to immense deposits of iron and copper ores, situated in the upper peninsula. Copper, found abundantly native as well as in ores, was utilized by the Indians before the coming of the white man. Extensive mining began about 1847 and for the ensuing 50 years Michigan's output of copper was about half that of all the states combined. Later, Montana, Arizona and Utah each surpassed Michigan in copper production. From 1845 to 1901 Michigan led in the output of iron ore, but with the development of the Mesabi Range, Minnesota took first place.

With mineral productions in 1929 amounting to $151,975,563, Michigan stood ninth among the states, ranking first in salt, magnesium and bromine; second in iron ore and amorphous graphite; third in cement, gypsum and manganiferous ore, and fourth in copper. The outstanding products were iron ore, 16,838,568 tons, valued at $47,597,976; and copper, 186,402,218 lbs., $32,806,790. Other important items of output in order of value were cement, 13,325,727 bbls., valued at $18,916,711; stone, 13,586,230 tons, $8,454,702; salt, 2,650,220 tons, $8,343,607; sand and gravel, 16,844,099 tons, $7,928,744; clay products, $6,217,018; petroleum, 4,528,000 bbls., $6,140,000; gypsum, 898,547 tons, $4,315,334; and coal, 804,869 tons, $2,904,000.

During 1929 191 mines and quarries gave employment to 22,287 persons who received $32,587,063 in salaries and wages.

Soil. Throughout the state the soils of Michigan are entirely of glacial origin. Those of the southern part of the lower peninsula are well adapted to agriculture. In general these consist of dark clay loams covering the underlying rock formations to an average depth of 250 ft. The soils of the north central district consist of much thinner and more sandy loams, while those of the northern section are mostly heavy blue clays. Both these types of soils are much less productive than those of the southern section. The upper peninsula is exceedingly swampy, possessing many lakes. There are some clay soils, but the prevailing surface deposits are sandy. In the rocky mining districts of the northwest, the country is either barren or covered by very poor, thin soil.

Agriculture. The chief crop products are grain, hay, vegetables and fruits.

In 1930 17,118,951 ac. or 46.5% of the entire land area was in farms, 169,372 in number, with an average size per farm of 101.1 ac. and an average value per acre of $67.80. Of the farm area 9,094,033 ac. was crop land; 5,891,890 ac., pasture land; and 824,666 ac., woodland. The total value of farm property was $1,428,827,520, of which $1,160,651,607 was represented by land and buildings; $105,562,502, by implements and machinery; and $162,613,411, by domestic animals.

According to the census of 1930 Michigan produced in 1929 field crops to the value of $175,314,607, ranking twenty-second among the states. It stood seventh in rye, eighth in sugar beets, and ninth in oats and hay. In vegetable production the state ranked second in cucumbers, third in celery, fifth in onions and sixth in potatoes; in fruit growing it stood second in cherries, third in grapes and raspberries, and fourth in apples. The chief crops were grain, $74,165,103; hay and forage, $46,332,562; vegetables (including potatoes), $34,023,401; fruits, $17,214,259, and sugar beets, 299,913 tons, $2,381,309. The chief grains were oats, 33,523,336 bu. grown on 1,194,239 ac., and corn, of which 15,635,217 bu. were harvested for grain and 1,704,079 tons cut for silage. Other grains were wheat, 13,711,136 bu.; barley, 4,178,549 bu., rye, 1,623,761 bu., and buckwheat, 317,356 bu. To the hay crop of 3,495,495 tons, timothy and clover contributed 2,551,775 tons, and alfalfa 846,090 tons. The potato crop, grown on 223,794 ac., yielded 15,911,808 bu. valued at $21,112,586; other leading vegetables were celery $2,076,462, dry onions $1,106,869, and tomatoes $951,851. The principal fruit crops were apples, 6,759,882 bu.; peaches, 997,660 bu.; cherries, 562,479 bu.; pears, 345,152 bu.; grapes, 117,822,405 lbs.; strawberries, 9,610,142 qts., and raspberries, 6,407,945 qts. Farm products sold by cooperative marketing dropped from $24,294,688 in 1919 to $16,581,237 in 1929, and farm supplies purchased by this method rose from $2,445,953 to $5,797,257. Farm machinery and equipment in 1930 included 150,922 automobiles, 36,768 motor trucks, 34,579 tractors, 14,892 electric motors, and 55,366 stationary gas engines.

Animal Industry. Dairying is the chief livestock interest. According to the census of 1930 the rank of Michigan among the states was eighth in milk produced, ninth in dairy products sold, tenth in milk cows, and third in yield of honey. The state ranked fifteenth in total value, $162,613,411, of domestic animals on farms. Among these were 1,528,161 cattle, reported from 143,510 farms or 85% of all farms in the state and valued at $90,144,590; also horses, 382,660 in number valued at $42,483,048; mules, 6,528; $701,745; sheep, 1,416,243, $11,606,057, and swine,

Of the cows on farms, 843,417 were kept mainly for milk production and 34,101 mainly for beef production. In 1929, 449,756,289 gals. of milk were produced; the total value of dairy products marketed was $71,099,796, including $45,754,747 for whole milk and $21,800,526 for cream sold as butterfat. The poultry raised was valued at $19,170,719, the number and value of the chief kinds being chickens, 18,146,102, $17,585,496; turkeys, 229,640, $716,278; ducks, 421,395, $493,520, and geese, 182,117, $375,425. The chickens sold, 8,723,917 in number, were valued at $8,574,822. Of 77,410,266 chicken eggs produced,

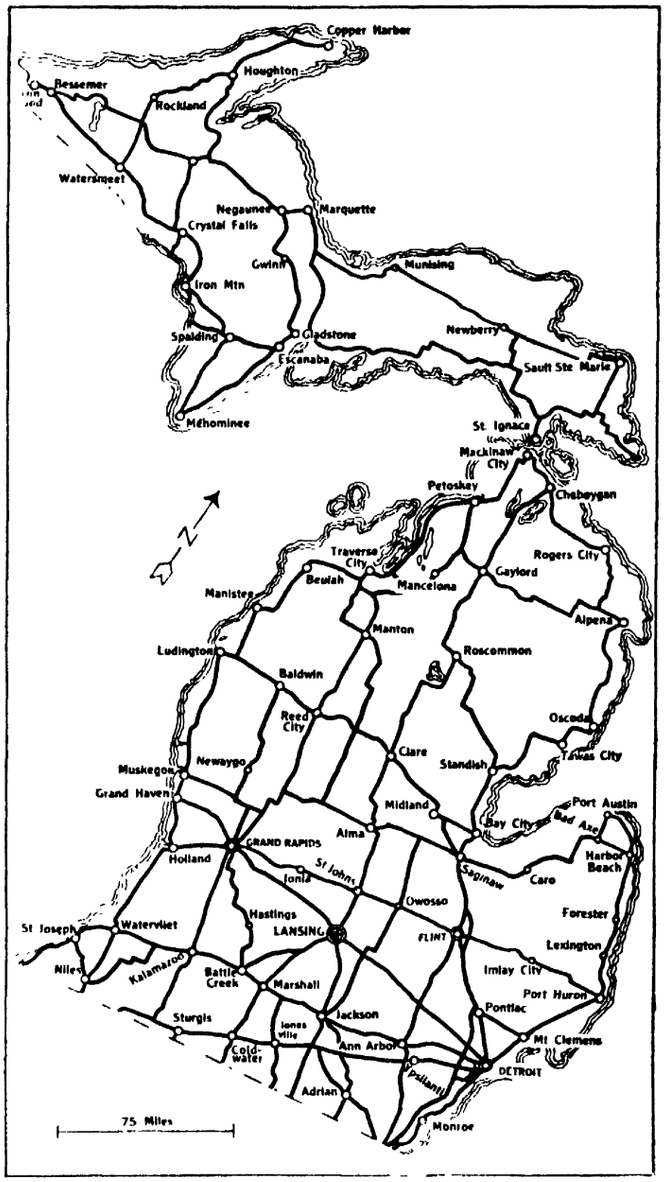
valued at $24,281,343, 57,384,525, with a value of $18,002,532, were marketed. The wool produced, 8,126,724 lbs., was valued at $2,737,967. Honey, reaching a total of 4,917,450 lbs. valued at $804,115, was produced from 92,082 hives.

Fisheries. In 1930, Michigan ranked thirteenth in the value of its fisheries, the total catch amounting to 33,373,000 lbs., valued at $3,248,000. There are commercial fisheries in both Lake Michigan and Lake Huron, being larger in the latter. Twenty-three Great Lake species are taken, including pike, carp, chubs, lake trout, suckers, lake herring, or cisco, yellow perch and whitefish. While most of the commercial fishing is with nets, there is an interesting winter variety of hand line fishing on Lake St. Clair and parts of Lake Huron. The fishermen live for weeks in tiny cabins mounted on runners. These they push from hole to hole cut through the ice, as the flag on the "tip up" attached to each line signals that a fish is hooked. The cabin, warmed by a stove, is pushed directly over the hole and the fish removed from the line through a hole in the floor.

Michigan has a very far-sighted conservation program and in 1930 spent $400,000 for fish propagation, a larger sum than any other state. Fishing licenses were issued to 134,965 sportsmen who paid $260,733 in fees. The state operates 17 hatcheries which employ 15 men. The output for 1930 was 16,443,642 trout, 742,639 bass, 70,883,730 other game fish and 133,640,900 commercial species. As a result, the many inland lakes, especially in the north, offer some of the finest fishing in the country. The United States Bureau of Fisheries also planted many fish in Michigan waters during 1930, including 88,500,000 whitefish, 29,461,000 lake trout, 6,690,000 pike perch, 729,500 brook trout, 100,000 cisco, 50,000 steelhead salmon and 50,000 other game fish.

Transportation. Michigan has good transportation facilities, by land as well as by water. Favored by a coast line 1,600 mi. long on four of the Great Lakes, several good harbors and several canals, a heavy volume of traffic is carried by water. The canals include the St. Clair Flats, running through the shallow water at the north end of Lake St. Clair, the Portage Lake Canal, connecting that lake with Lake Superior, and the SAULT STE. MARIE CANAL, which eliminates the rapids of the St. Mary's River. The latter waterway develops an extremely heavy traffic volume. The railway service also is adequate, with a total mileage in 1930 of 8,155. The principal systems are the Michigan Central, Pere Marquette, Grand Trunk, Michigan Southern and Lake Shore.

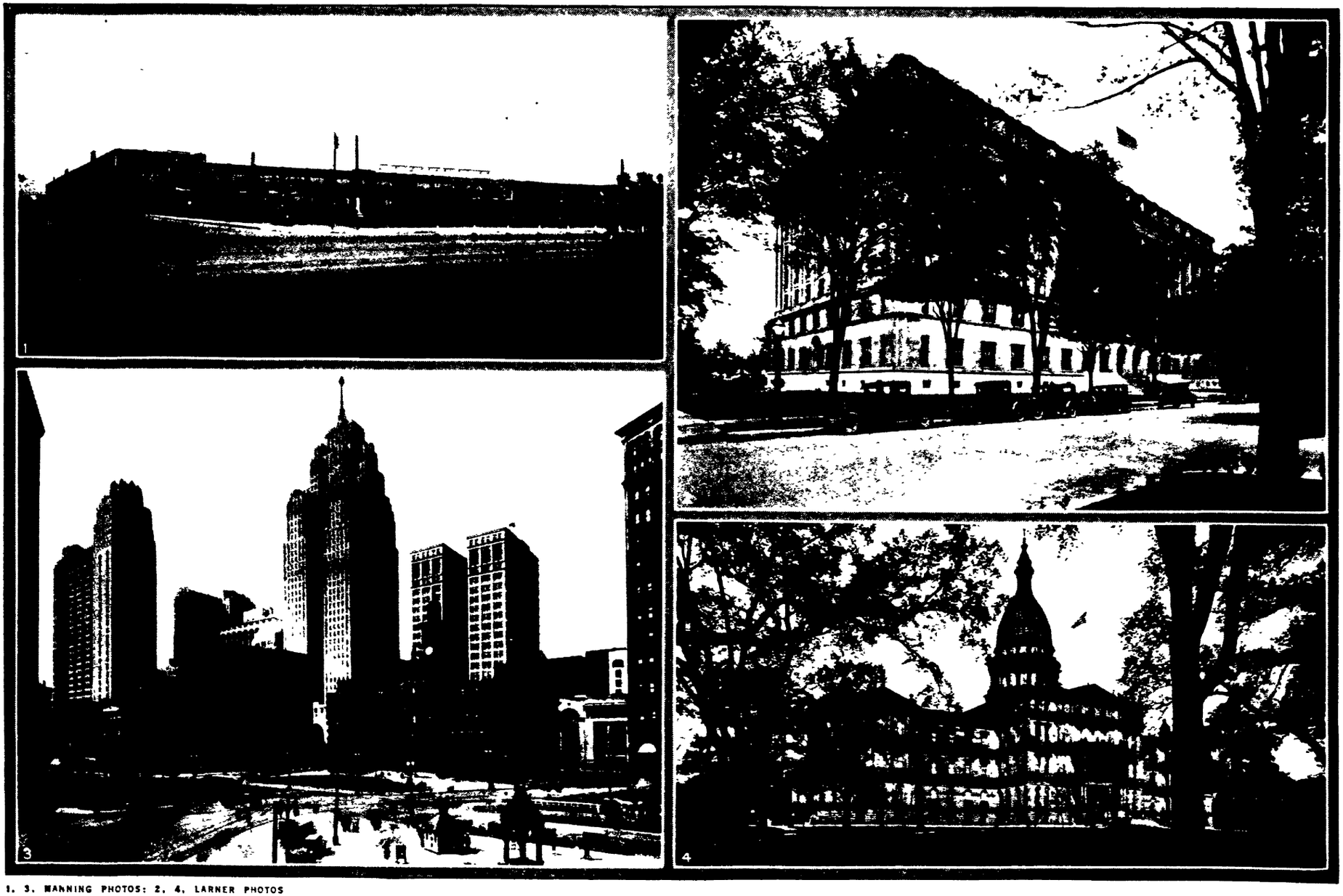
The state's highway system is well maintained, with a total mileage of 106,158 on Jan. 1, 1930, including 25,143 mi. of surfaced roads and 7,139 mi. of state highways. Highway expenditures during 1929 were $75,910,232, a sum exceeded only in New York and Pennsylvania. Of this amount, $34,512,336 was paid by the state and $41,397,896 by county and local governments. The state gasoline tax produced an income of $21,713,489 in 1930 as against $10,081,776 in 1926. Motor vehicle registrations were 1,328,209 in 1930 compared with 989,010 in 1925. The growth of transportation by truck is indicated by registrations, which increased from 103,486 in 1925 to 167,158 in 1930. During the same period the number of buses in operation increased from 1,592 to 2,785, about 75%.



MICHIGAN STATE ROADS

Manufactures. Early in its history Michigan established important manufactures. Noteworthy factors in their development were abundant forest and mineral resources, good transportation and an advantageous position in the growing Middle West. Although substantial, the growth of manufactures previous to 1900 was but slight in comparison with the unparalleled expansion that has accompanied the rise of the motor vehicle industry centered at Detroit. During the 25-year period 1904-1929 the manufactures of the state increased in value more than 1,000 per cent.

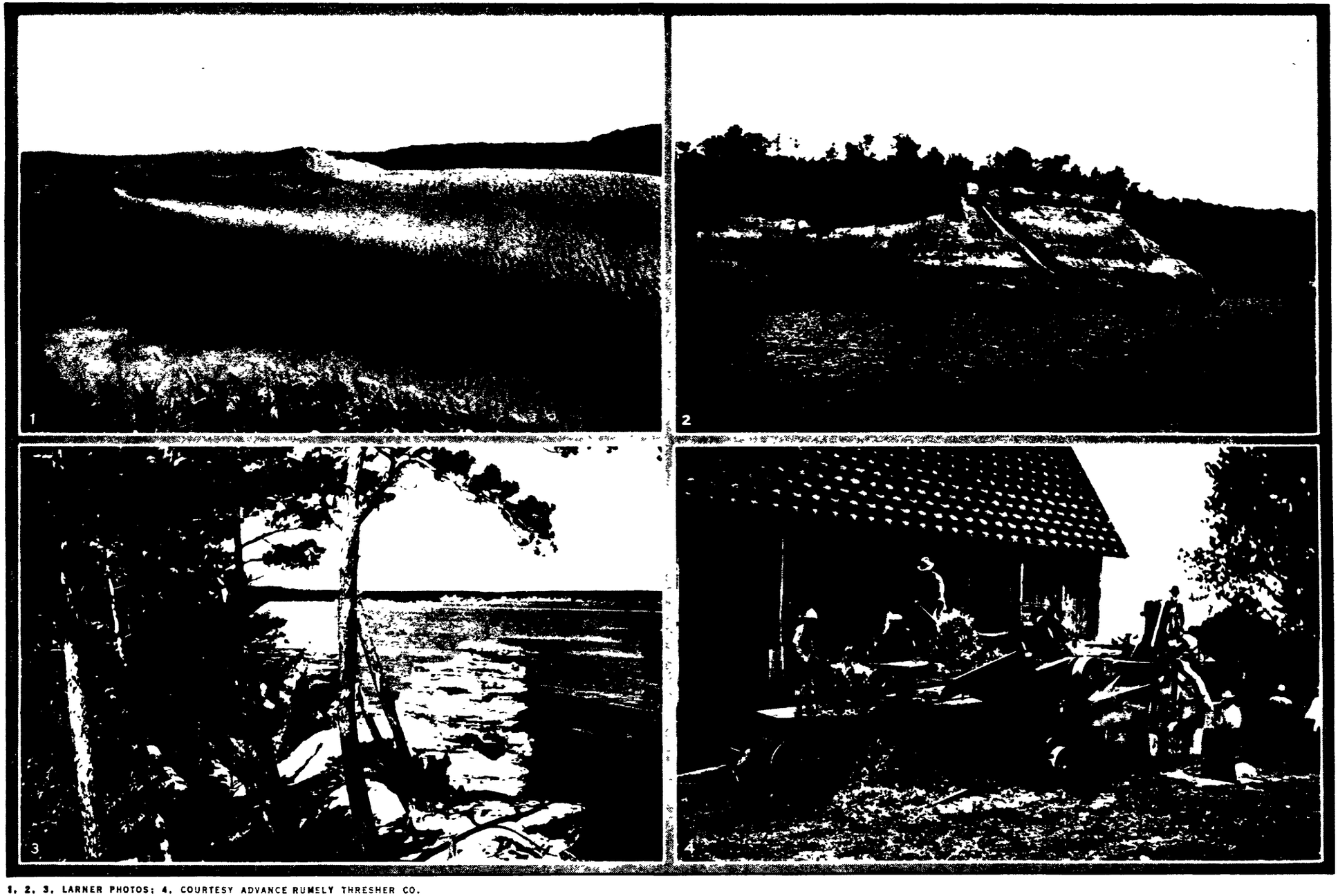
According to the Census of 1930 Michigan with manufactures for 1929 valued at $4,656,718,046 stood fifth among the states. Its 6,686 establishments gave employment to 69,144 officers and employees, who



1, 3, MANNING PHOTOS; 2, 4, LARNER PHOTOS

MICHIGAN CITIES—DETROIT AND LANSING

1. Continental Motors Corporation Building, Detroit. **2.** Administration Building, Lansing.
3. Detroit City Hall at Woodward and Michigan Avenues backed by the Penobscott Building, center; Union Trust Co., left, and Ford Building, right. **4.** State Capitol, Lansing.



1, 2, 3, LARNER PHOTOS; 4, COURTESY ADVANCE RUMELY THRESHER CO.

COUNTRYSIDE AND LAKESIDE IN MICHIGAN

1. Wind-rippled sand dunes on Lake Michigan. **2.** Pictured Rocks along the Lake Superior shore, east of Munising. **3.** Miners' Castle in the Pictured Rocks. **4.** Threshing beans with a modern bean huller on a Michigan farm.

MICHIGAN

Area, 57,980 sq. m.
Pop., 4,842,325

PRINCIPAL CITIES

Pop.—Thousands

13 Adrian..... K 19
8 Albion..... N 16
7 Alma..... N 17
12 Alpena..... P 23
44 Battle Creek..... Q 20
47 Bay City..... N 20
4 Belding..... N 15
15 Benton Harbor..... Q 10
4 Bessemer..... N 21
5 Blk. RapidsM 14
10 Birmingham..... P 23
4 Buchanan..... K 10
10 Cadillac..... M 18
15 Charlotte..... K 16
5 Cheboygan..... L 18
7 Coldwater..... R 16
50 Dearborn..... Q 22
1349 Detroit..... P 23
4 Dowagiac..... Q 11
6 E. Detroit..... P 24
4 E. Gd. Rapids..... O 17
4 E. Lansing..... O 18
13 Ecorse..... Q 23
4 Escanaba..... O 24
21 Ferndale..... P 23
5 Gladstone..... G 8
8 Grand Haven..... O 11
4 Grand Ledge..... O 17
169 Grand Rapids..... O 17
5 Greenville..... N 16
5 Grosse Pointe..... P 24
Park.....
56 Hamtramck..... P 23
6 Hancock..... C 3
5 Hastings..... P 15
53 Highland Park..... P 23
6 Hillsdale..... R 17
14 Holland..... O 11
4 Houghton..... C 3
4 Howell..... P 20
4 Ishpeming..... G 22
6 Ionia..... O 15
12 Iron Mount..... G 4
Falls.....
5 Iron River..... F 3
14 Ironwood..... B 21
4 Ishpeming..... E 6
55 Jackson..... P 18
46 Kalamazoo..... Q 13
6 Kingsford..... G 4
78 Lansing..... O 18
4 Lapeer..... O 22
5 Laurium..... C 3
12 Lincoln Park..... P 23
4 Ludington..... O 13
8 Manistee..... K 11
6 Manistique..... E 7
15 Marquette..... Q 16
10 Menominee..... L 16
4 Midland..... N 18
18 Monroe..... R 22
13 Mt. Clemens..... P 24
5 Mount
Pleasant..... M 16
6 Munising..... E 10
41 Muskegon..... N 11
10 Muskegon
Heights..... N 11
7 Negaunee..... E 6
11 Niles..... R 11
14 Owosso..... O 19
4 Petoskey..... O 16
65 Pontiac..... P 22
31 Port Huron..... O 25
17 River Rouge
Rochester..... P 23
Roseville..... P 23
23 Royal Oak..... P 23
81 Saginaw..... N 20
7 St. Clair
Shores..... P 24
4 St. Ignace..... J 17
4 St. Joseph..... Q 10
Sault Sainte
Marie..... E 18
5 Sturgis..... R 11
7 Three Rivers..... R 13
13 Traverse City..... J 13
4 Trenton..... Q 22
4 Wakefield..... B 21
28 Wyandotte..... Q 23
10 Ypsilanti..... Q 21

received $201,283,914 in salaries, and 530,035 wage earners, who were paid $840,505,363 in wages. These factories used a total of 2,356,746 horse power, expended $111,920,265 for fuel and power, and $2,477,453,902 for materials and supplies, and added by the process of manufacture $2,067,343,879 to the value of their output.

In this output there were 150 separately enumerated groups of manufactures. The state ranked first in the production of motor vehicles and of motor vehicle bodies and parts, which together comprised 49% of the total manufactures of the state. It stood second in paper and hardware; third in engines, furniture and stoves; fourth in pianos and manufactured gas; fifth in foundry and machine shop products and condensed milk, and sixth in paints and varnishes, patent medicines and pumps. Among the manufactures in which Michigan ranked seventh were iron and steel rolling mill products, bread and bakery products, planing mill products, printing and publishing and ship building. The state stood eighth in the production of leather, wood pulp and ice cream; ninth in electric machinery, and eleventh in lumber.

The principal factory industries, which produced 74% of the total manufactures in order of value of output were:

Industry or Product	*No. Persons Employed*	*Value of Products $*
Motor vehicles	122,273	1,549,658,499
Motor vehicle bodies and parts	113,218	738,406,167
Foundry and machine shop products	47,562	216,312,128
Furniture	23,466	99,714,641
Paper	12,626	97,322,852
Brass and bronze products	11,450	91,469,188
Bread and bakery products	10,398	73,519,459
Meat packing	2,886	65,025,621
Electric machinery	9,546	62,394,174
Printing and publishing, newspaper and periodical	8,148	59,211,550
Machine tool accessories	10,124	57,704,438
Iron and steel rolling mill products	5,056	56,183,680
Chemicals	6,129	53,183,206
Engines and turbines	10,070	51,454,849
Hardware	10,792	47,985,985
Paints and varnishes	2,791	43,692,920
Printing and publishing, book and job	7,647	40,905,467
Manufactured gas	5,073	40,704,848

The Detroit industrial area, comprising Wayne and Oakland counties, with manufactures valued at $2,842,320,120, produced three-fifths of the state's output. To this total Detroit contributed $2,013,179,287, Wayne Co. exclusive of Detroit, $574,302,997, and Oakland Co., $254,837,836. The cities next in importance to Detroit were Pontiac, $248,201,533; Lansing, $219,381,871, and Grand Rapids, $156,653,826. Other centers with products valued from about $60,000,000 to $90,000,000 were Battle Creek, Kalamazoo, Saginaw, Muskegon and Jackson.

Commerce. According to the census of 1930, there were in 1929 5,273 wholesaling establishments in Michigan, with total sales of $2,174,202,745. This volume represented 3.13% of the wholesale trade of the United States, and was exceeded in only eight states. These wholesalers gave full-time employment to 47,424 men and women, whose annual salaries aggregated $97,112,780. Detroit, the chief wholesaling center, and one of the country's important points of distribution, reported wholesale trade amounting to $1,578,055,671 or over 70% of the total for the entire state. Grand Rapids was also important.

The total sales of the 56,290 retail stores were $2,235,570,860, a volume surpassed in only five other states. Average sales per store were the highest of any state in the Union, $39,715. Sales per capita amounted to $461.67.

CHIEF RETAIL DISTRIBUTING GROUPS

Group	*No. of Stores*	*Sales*	*% of Total*
Automotive	10,404	$505,302,840	22.59
Food	17,476	498,684,322	22.30
General Mdse.	2,288	302,887,695	13.56
Lumber & Bldg.	3,529	204,757,821	9.16
Apparel	4,608	184,206,779	8.24
Furn. & Household	1,545	94,603,353	4.23
All other stores	16,440	445,128,050	19.92
Total, all stores	56,290	$2,235,570,860	

Detroit, the principal port, handled water-borne traffic amounting to 5,414,972 tons with a value of $292,564,641. The value of all traffic on the Detroit River was $1,195,774,326. The largest items were automobiles and trucks.

Finance and Banking. The assessed value of all taxable property in 1929 was $8,358,319,747. On Dec. 9, 1930, the state's bonded debt was $82,250,000, less sinking funds which reduced this amount to a net of $53,298,684. Total state revenues in 1928 were $92,219,813; total expenditures, $80,052,478. The chief sources of revenue were property and special taxes, $48,138,735, gasoline taxes, $13,547,007, and licenses, $30,432,534. This included motor vehicle and corporation taxes. The principal payments were for highways, $22,786,193, other permanent improvements, educational aid, $16,099,559, and debt service, $4,565,732.

The Bank of Michigan, the first in the Territory, was organized in 1817. It suffered severe losses in the panic of 1837 and was finally liquidated in 1842. Nine new banks were organized in 1835, shortly after Michigan was admitted to statehood. A free banking law was passed in 1837, but it was so carelessly administered that by 1839, 42 banks had been forced into receivership and over a million dollars in paper currency became worthless. The state's banking system did not recover from this depression for many years. In 1857 a new banking law similar to that of New York state was adopted. There were 808 banks in Michigan in 1930 of which 123 were national banks, 598 state banks and trust companies and 87 private banks. These institutions had an aggregate capital of $122,264,900; their surplus and undivided profits amounted to $166,150,000. Total resources were $2,388,842,000, with loans and discounts, including rediscounts, amounting to $1,451,788. Demand deposits totaled $839,153,000; time deposits, including

postal savings, were $1,048,295. Per capita demand and time deposits were $387.09; per capita savings deposits, $210.50. The total savings of $1,026,384,000 were owned by 2,824,777 depositors. National bank circulation aggregated $17,782,000. Bank clearings for the year ended Sept. 30, 1930, were $9,374,068,000 in Detroit, the state's most active banking center.

Government. The law-making power of Michigan is vested in a legislature consisting of a senate composed of 32 members and a house of representatives of 100 members, all elected for terms of two years and meeting in biennial sessions, unlimited in duration. The executive department consists of a governor, lieutenant governor, secretary of state, treasurer, auditor general and attorney-general. The governor is elected for a term of two years at a salary of $5,000 per year. Judicial power is vested in a supreme court, in circuit courts, probate courts and justices of the peace. The supreme court consists of eight judges elected for terms of eight years at salaries of $10,000 per annum.

Social Welfare Institutions. There is a state public school for dependent and neglected children at Coldwater, a school for the deaf at Flint and for the blind at Lansing and an employment institution for the blind at Saginaw. At Lapeer is a home and training school for epileptics and feeble-minded of all ages. The Michigan Farm Colony for Epileptics is at Wahjamega. A vocational school for boys is located at Lansing and a training school for girls at Adrian. The Michigan Soldiers' Home is at Soldiers Home P.O. There is a psychopathic hospital at Ann Arbor, a state sanitarium at Howell and state hospitals at Kalamazoo, Pontiac, Traverse City, Newberry and Ionia. Houses of correction for men and women are at Detroit and also at Marquette. Here also is a branch of the state prison. The main prison is at Jackson and the reformatory is at Ionia.

Education. The first school was established in Detroit in 1755, and in 1817 the "Catholepistemiad," or University of Michigania, was created by act of legislature. Free schools were established throughout the state in 1869. By 1929 there were 818,560 pupils in the elementary schools and 17,000 teachers. The 600 high schools had 141,536 pupils and 2,800 teachers. Attendance is compulsory for children from 7 to 16 years for the full term of school.

The number of persons from 5 to 20 years atttending school in 1930 was 1,090,754, or 75.8% of the population within the ages specified, as compared with 710,341, or 67.8%, in 1920. Persons 10 years and over unable to read and write numbered 76,800 or 2%, in 1930, as compared with 88,046, or 3%, ten years before. The number of foreign-born white illiterates in 1930 was 55,034, or 6.7%, as compared with 70,534, or 9.9%, in 1920.

The state institutions of higher learning include the University of Michigan at Ann Arbor, the Michigan State College of Agriculture and Applied Sciences at East Lansing, the Michigan College of Mining and Technology at Houghton, and normal schools at Ypsilanti, Mount Pleasant, Marquette and Kalamazoo. Among the private institutions are Albion College at Albion, Alma College at Alma, the University of Detroit and Hope College at Holland.

Population. In 1930 Michigan ranked seventh among the states with a population of 4,842,325 or an average of 84.2 per sq. mi., an increase of 1,173,913 or 32.0% over 1920. The population rose from 4,712 in 1810 to 397,654 in 1850, 2,420,982 in 1900, 2,810,173 in 1910 and to 3,668,412 in 1920. In 1930 there were 4,650,171 or 96.0% whites, 169,453 or 3.5% Negroes, 13,336 or 0.3% Mexicans and 7,080 or 0.1% Indians. Of the whites, 3,809,903 were native born and 840,268 were foreign born. Of the total foreign stock, including foreign born, foreign and mixed parentage, 411,091 or 18.0% were Canadian other than French Canadian, 365,263 or 16.0% German, and 320,534 or 14.0% Polish. The urban population was 3,302,075 or 68.2% of the total, an increase of 1,060,515 or 47.3% from 1920; the rural population was 1,540,250 or 31.8% of the total, an increase of 113,398 or 7.9% since 1920. In 1930 the six largest cities were: Detroit, 1,568,662; Grand Rapids, 168,592; Flint, 156,492; Saginaw, 80,715; Lansing, 78,397; Pontiac, 64,928.

Occupations. In 1930 1,927,347 persons, or 39.8% of the population, were gainful workers 10 years old or older; 81.3% of these were males and 18.7% were females; 71.3% were native white; 23.9% foreign-born white; 4.3% Negro, and 0.5% other races. Of the females 15 years old or older 52.6% were single, 31.8% were married and 15.6% were widowed or divorced.

Among the principal occupations, with number of workers, were factory operatives and laborers, 324,792 men and 45,975 women, including 159,637 men and 12,451 women in automobile factories; farmers, 158,945 and farm wage workers, 64,291; clerks, 60,508 men and 34,764 women; salespersons, 60,713 men and 24,573 women; servants, 11,218 men and 53,516 women; retail dealers, 62,425; machinists, 58,936; chauffeurs, 43,120; carpenters, 40,335; school teachers, 6,966 men and 32,586 women; building laborers, 38,639; stenographers, 1,101 men and 30,111 women; bookkeepers and cashiers, 8,926 men and 19,676 women; toolmakers, 25,285; manufacturing foremen and overseers, 24,158; mechanics, 23,040, and painters and glaziers, 19,507.

HISTORY

French traders and missionaries, coming from the settlements of the St. Lawrence valley by way of the Ottawa River, Lake Nipissing, and Georgian Bay, visited Michigan early in the 17th century. Detroit was visited in 1610; NICOLET passed through the Straits of Michilimackinac in 1632; the Jesuit Fathers JOGUES and Raymbault visited the Indians at Sault Ste. Marie in 1641. MARQUETTE founded at Sault Ste. Marie the first permanent settlement in Michigan, 1668, and a mission at Michilimackinac, 1671. In 1701 Cadillac founded Detroit, a military post and

important point in the fur trade of New France. Detroit and the straggling outposts were taken by the English, 1760-1761, and held despite PONTIAC'S CONSPIRACY. Although Michigan became United States territory after the REVOLUTIONARY WAR, the British, meanwhile profiting by the fur trade, did not evacuate the posts of Detroit and Michilimackinac until 1796. Originally part of the Northwest Territory, governed accordingly under the ORDINANCE OF 1787, the area of the present Michigan was embodied in INDIANA Territory in 1802. In 1805 Michigan Territory was organized, not including the upper peninsula; its white population in 1810 numbered 4,762, of whom 1,650 were in Detroit, the capital. During the WAR OF 1812 Gen. William Hull, first governor of the territory, surrendered Detroit to the enemy, and Michigan was again under British rule until Autumn, 1813; Michilimackinac was the only post not recaptured by the close of the war.

Hitherto a wilderness in which the fur trade was almost the sole economic pursuit, a domain misrepresented by government surveyors as unfit for settlement, Michigan entered a new era during LEWIS CASS's tenure as governor of the territory, 1813-1831. Interference of the British in the Indian trade was checked; the American Fur Company, with western headquarters at Michilimackinac, reorganized and dominated the fur trade. The Indians were persuaded to vacate large areas of arable land. In 1818 the first public land office in Michigan was opened at Detroit; in the same year the arrival of the steamboat *Walk-in-the-Water* inaugurated better communication with the East, and foreshadowed commercial development and increased immigration which awaited only the completion of the Erie Canal in 1825. In 1820 the population of the territory was 8,896; twenty years later it was 212,267. Admission to the Union was delayed by a dispute with OHIO over the southern boundary of Michigan, settled in 1837 in favor of Ohio. The upper peninsula was taken from Wisconsin Territory and awarded to Michigan as compensation. In 1835 the people adopted a state constitution and elected officers; from Nov. 1, 1835, Michigan was *de facto* a state, and was formally admitted by Congress on Jan. 26, 1837. Lansing was chosen the permanent capital in 1847. In 1932 Michigan, usually a Republican state, gave its 19 electoral votes to Roosevelt. A Democrat, William A. Comstock, was elected governor.

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MICHIGAN, LAKE, one of the chain of Great Lakes in east central America. It is situated between 41° 37′ and 46° 6′ N. lat. and 84° 45′ and 88° 00′ W. long., and is bounded on the west by Wisconsin, on the north and east by Michigan and on the south by Illinois and Indiana. Of the five lakes, Michigan is the only one located entirely within the United States. Its greatest length, which is from north to south, is 307 mi.; breadth 118 mi.; and surface areas 22,400 sq. mi., slightly less than that of Lake Huron. These two lakes have the same mean elevation of 580.94 ft. and are connected by Mackinac Straits at their northern extremities. Lake Michigan has a maximum depth of 870 ft., which is 289 ft. below sea level. The mean depth is 335 ft. The southern portion has an unusually regular coastline but the northern part is indented by Grand Traverse Bay and Green Bay through which it receives the Fox River. This stream is joined by a canal with the Wisconsin River, thus establishing a continuous waterway between Lake Michigan and the Mississippi River. Another such connection is had by way of the Chicago River, the Chicago Sanitary and Ship Canal, the Illinois and Michigan Canal and the Illinois River. Other stream tributaries to the lake include the Menominee, Muskegon, St. Joseph and Grand. The Beaver and Manitou islands are situated in its northern expanse.

Lake Michigan has a watershed of 69,040 sq. mi. comprising rich mining, industrial and agricultural areas. The chief harbor cities situated on its shores are Chicago, Indiana Harbor, Michigan City, Benton Harbor, Grand Haven, Muskegon, Manistique, Escanaba, Menominee, Green Bay, Sheboygan, Manitowoc and Milwaukee. Immense cargoes of iron and copper ores and metals, coal, building material, woodpulp, paper and vegetable food products clear through these ports every year. In 1929 the Milwaukee harbor handled 8,564,863 tons of freight consisting chiefly of non-metallic minerals and food products; Escanaba shipped 7,110,405 tons of ores and metals; and the port of Chicago shipped and received 17,552,820 tons of which 1,202,115 tons was food, 8,884,423 tons ores and metals, and 6,861,858 tons coal and other non-metallic minerals.

The first white man to discover and navigate Lake Michigan was Jean Nicolet, a Jesuit priest who in 1634 was seeking for a place to establish a mission among the Indians. At that time the Chippewas were settled in the wild rice regions around Lake Winnebago, Wis., and fur-trading connections were established with them shortly after the discovery of the lake. Commerce with eastern points developed rapidly due to the naturally navigable connection with Lake Huron through Mackinac Straits. The shipping season extends generally from Apr. 12 to Dec. 15.

MICHIGAN, UNIVERSITY OF, at Ann Arbor, Mich., a coeducational state university, had its beginning in the Catholepistemiad, or University of Michigania, established in Detroit in 1817. When Michigan became a state 20 years later, the present university was organized and established at Ann Arbor as its successor. The law establishing the university specified the organization of departments of Literature, Science and the Arts, Medicine and Law. Since then colleges and schools of Engineering and Architecture, Pharmacy, Dental Surgery, Business Administration and the Graduate School have been added. Michigan's productive funds, including Federal, state and

private endowments, amounted in 1931 to $4,308,546. There are special collections on Greco-Egyptian papyri, and Oriental manuscripts in the library of 799,573 volumes. A separate building houses the William L. Clements Library of American History, which contains a collection of source material for American History, especially rich in the Discovery and Revolutionary Periods. The Detroit Observatory holds the Lamont telescope, which was taken to Africa in 1926 for observations of the Southern skies. In 1931-32 there was a student enrollment of approximately 15,700, and a faculty of 833 headed by Pres. ALEXANDER G. RUTHVEN.

MICHIGAN CITY, a city of northwestern Indiana, in La Porte Co., situated on Lake Michigan, about 32 mi. east of Chicago by boat, and 56 mi. by rail. Several railroads, a municipal airport, motor bus companies and lake steamers serve the city. It has a good harbor. Manufactures include metal and wood products and textiles. In 1929 the value of the factory output was about $37,000,000; the retail trade amounted to $14,069,099. The State prison of northern Indiana, a government life-saving station, and a $7,000,000 power-plant of the Northern Indiana Public Service are located in Michigan City. Indiana Dunes State Park is directly accessible by highway. The city was founded in 1831. Pop. 1920, 19,457; 1930, 26,735.

MICHIGAN STATE COLLEGE OF AGRICULTURE AND APPLIED SCIENCE, a state-supported coeducational institution at East Lansing, Mich. Established in 1855 through the influence of the Michigan State Agricultural Society, it was the first state controlled institution in the United States to provide instruction in scientific and practical agriculture. In 1861 the college was placed under the control of the State Board of Agriculture, and in 1885 a department of mechanic arts was added. The name was changed from Michigan Agricultural College to its present name in 1925. Instruction is presented in six divisions: agriculture, engineering, home economics, veterinary science, applied science and liberal arts. The productive funds in 1931 amounted to $1,053,898. The library contained 84,878 volumes. In 1931-32 there were 3,272 students and a faculty of 306, headed by Pres. Robert S. Shaw.

MICHOACAN, a state of Mexico, situated on the Pacific coast, in the southern part of the country, with an area of 22,621 sq. mi., and an elevation of about 3,000 ft. It is one of the most interesting states of the republic, because of the mysterious origin and subsequent history of its first settlers, the Tarascan Indians. Its surface is broken by mountain ranges which traverse the state in many directions, rising to peaks 12,000 ft. high, and dropping to valleys of great beauty and fertility. It is the most active volcanic district in Mexico, and Jorullo, rising 1,700 ft. above its surroundings, is the best known of the volcanoes. There are a number of lakes in the state, among which are Cuitzeo, Chapala and Patzcuaro. The two rivers of note are the Lerma and the Balsas. Indian mounds, ruins of temples, carvings on rock, and many other relics abound. A long list of tropical fruits, vegetables and flowers are produced in Michoacan, and it is known for its fine coffee and valuable orchids, while some of the oldest olive trees in Mexico are found here. The capital of the state is Morelia and other towns are Zitacuaro, Uruapan, Patzcuaro and Tacambaro. Pop. 1921, 939,849; 1930, 1,014,020.

MICKIEWICZ, ADAM (1798-1855), Polish poet, was born near Novogrodek, Lithuania, Dec. 24, 1798. He was banished from Poland in 1824 and four years later settled in St. Petersburg. His friendship with Pushkin and the influence of Byron and of German Romanticism are strong elements in his later work. In 1828 Mickiewicz wrote the well-known epic, *Conrad Wallenrad,* followed by his even more famous *Pan Thadeusz,* 1834, an epic of Lithuanian life in 1812. An exile, he necessarily traveled extensively, meeting Goethe at Weimar, and his Polish contemporaries, Krasinski and Slowacki, in Switzerland. In Rome he became intimate with James Fenimore Cooper. In his later life the poet settled in Paris, where he delivered notable lectures on Slavic literature. Mickiewicz was sent as a special emissary of the French Government to Turkey, and died in Constantinople, Nov. 26, 1855.

MICMAC, a North American Indian tribe belonging to the Algonkian linguistic stock. They inhabited formerly Nova Scotia, Cape Breton and Prince Edward Islands, the northern part of New Brunswick and perhaps parts of southern and western Newfoundland. They were firm allies of the French in early historic time and in consequence resisted the establishment of English settlements in Nova Scotia and New Brunswick after these provinces became British territory. Culturally they resemble the other Northeastern Algonkian tribes; they lived in the typical conical houses covered with bark, skin or mats and dressed in skin clothing. They were fine canoemen using birchbark canoes, and lived to a large extent on the products of the adjacent waters. So far as is now known, the Micmac practiced no agriculture.

MICROANALYSIS, that subdivision of analytical chemistry which is concerned with investigations where only minute quantities of the unknown substance are available, or where it concerns the tracing of slight impurities, as in foods and drinking water, the proving, in criminology, of the presence or absence of toxic substances, as well as the identification of blood stains as of human or animal origin. Where complete quantitative analysis is required, gravimetric methods are often followed, and use is made of the extremely accurate microbalances of the present-day which allow a precision of about 1:10,000,000. Where it concerns only the tracing of specified elements or compounds, the analysis often relies upon reactions which produce an intensely colored substance, the quantitative amount present then being estimated by comparing the color produced in solution with that of a solution of known strength. Recently methods have been perfected which make possible precise quan-

titative determinations by means of the spectroscope, hitherto only used for qualitative work. This instrument often can show the presence of amounts of as little as one one-hundred-millionth part of a gram.

MICROCEPHALY, a disorder in which the capacity of the skull is less than normal, and the brain is abnormally small. No satisfactory explanation for the condition has been given. It has been suggested that it is due to early ossification of the bones in the skull. The ductless glands, possibly, are a factor in causing the disorder.

The symptoms caused by the condition are like those seen in cerebral palsy, consisting of paralysis, and lack of mental development. Microcephaly is responsible for idiocy when a microcephalic child survives infancy. No satisfactory treatment has been found.

MICROCLINE, a form of FELDSPAR which is frequently green, when it is called Amazon stone. It has the same composition as ORTHOCLASE, a potassium aluminium silicate, but differs from orthoclase in crystallization, being triclinic instead of monoclinic. The name refers to this difference, which is practically determinable only by the microscope. Microcline is also white, yellow, gray and red. It occurs sometimes with orthoclase in pegmatites, granites and gneisses. *See also* TRICLINIC SYSTEM; MONOCLINIC SYSTEM.

MICROCOSM, a little world, the opposite of macrocosm. It refers to the inner world of man as contrasted with the outer world of nature. But this inner world is in some sense like the outer world. It is that world in miniature. The theory of the monad, as held by Bruno and Leibniz, is an illustration of the doctrine. Each monad, although separate and leading an independent life of its own, nevertheless mirrors the whole of reality. By the part the whole may be known, because the part is but a miniature of the whole. Lotze's *Microcosmus* is a more recent attempt to bring together the outer and the inner worlds.

MICROCOSMIC SALT, ammonium sodium hydrogen orthophosphate, $NH_4NaHPO_4 4H_2O$. It occurs in nature as the mineral stercorite and it may be produced by boiling an aqueous solution of crystalline sodium phosphate and ammonium chloride, filtering and cooling to crystallization. Its crystals melt readily on heating to produce sodium phosphate. Microcosmic salt is used chiefly as a flux to dissolve oxides in blowpipe work.

MICROFARAD. *See* CONDENSER, ELECTRICAL; FARAD.

MICRONESIA, a division of Oceania consisting of scattered groups of small islands north and east of Melanesia and west of the Philippines. The principal divisions are Mariana or Ladrone islands, Marshall and Caroline islands, all belonging to Japan; Guam, belonging to the United States; and the Gilbert group, belonging to Great Britain. They are grouped together because of the similarity of language and racial characteristics of their inhabitants who are a mixture of Polynesian and Malaysian stocks.

MICRONESIAN, a group of the MALAYO-POLYNESIAN linguistic family, spoken in the Gilbert, Marshall, Caroline and Mariana Archipelagoes, and in the island of Yap. In grammatical structure it closely resembles MELANESIAN; and its personal pronoun has not only both an inclusive and an exclusive form for the first plural ("we, including you," "we, but not you"), but also a quasi-dual, trial and quadrial ("they two, they three, they four") formed by combining the words for "two," "three," and "four" with the plural.

MICROPHONE, a device for converting SOUND waves into electrical impulses. The general principle upon which the conversion is effected is the utilization of sound-wave energy to vary the flow of current in a circuit by varying the properties of the circuit. The sound wave is converted into mechanical motion of corresponding vibrational characteristics by means of a DIAPHRAGM. Simultaneously with this conversion, the motion of the diaphragm varies the RESISTANCE, CAPACITANCE or INDUCTANCE of the circuit and, consequently, the flow of current.

The ordinary TELEPHONE transmitter uses the resistance type of microphone in which the resistance unit comprises a cell of granular carbon between two polished carbon plates. One of the carbon plates is connected to the diaphragm so that its motion varies the pressure between the contact surfaces of the carbon particles and hence the resistance of the unit. This type of microphone is unsatisfactory for the transmission of music, because it operates on a narrow FREQUENCY band. Two other types of carbon resistance microphones are used for "high-quality" sounds. One utilizes a duralumin diaphragm stretched for a high natural period of frequency and having a carbon capsule on each side of it. The other type comprises a marble block having a layer of granular carbon covered by a mica or rubber diaphragm held in place by an ebonite rim. The terminals extend through the block to carbon electrodes at the outer edges of the carbon layer.

The condenser or capacitance microphone consists of a two plate CONDENSER, one of whose plates is a duralumin diaphragm stretched to a high natural period of vibration.

One type of induction microphone comprises an aluminum coil diaphragm suspended in a magnetic field (*see* MAGNETISM). The field is set up by an electromagnet and the diaphragm is held in position between the magnetic poles by cotton wool pads. The current impulses set up by the action of microphone are usually amplified before being transmitted.

The radio has been the incentive for the development of microphones which operate with great sensitivity and without undue distortion of the sounds passing through them, qualities not possessed by the telephone transmitter. *See also* RADIO TRANSMITTER.

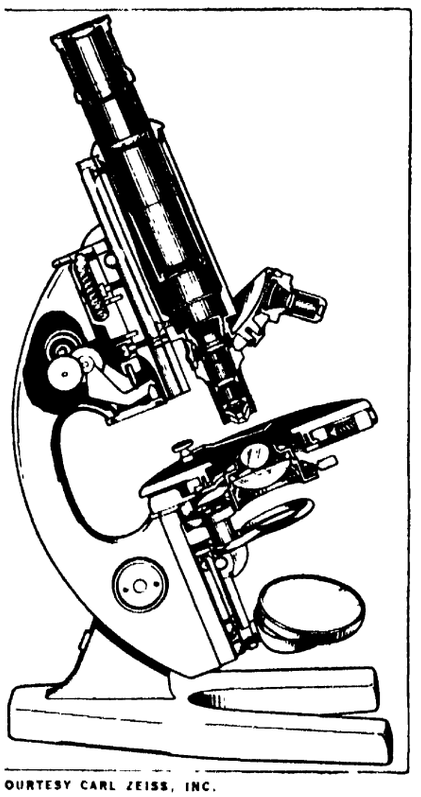
MICROPHOTOMETER, an instrument of very high accuracy used in measuring intensity of light as recorded on a photographic plate.

MICROSCOPE, an optical instrument for magnifying small objects. The amount of magnification may be expressed as a given number of *diameters* or of *times,* the terms designating the linear and areal

magnifications respectively. The magnification, measured in diameters, is the ratio of an apparent length as viewed through the microscope to the actual length, whereas the magnification expressed as *times* is the ratio of the apparent area, viewed through the microscope, to the actual area. It is evident that the areal magnification is the square of the linear magnification.

Simple Microscope. For the lower magnifications, the simple microscope, sometimes called a *loup*, is employed. In the simplest form, this is a single positive LENS. For better results two or more lenses mounted close together are employed in order that the aberrations (*see* ABERRATION IN OPTICAL SYSTEMS) may be corrected. The magnification, in diameters, is approximately equal to 250 divided by the focal length in millimeters. Simple microscopes giving magnifications greater than 30 diameters are now seldom made, although higher magnifications were formerly achieved when it was believed that the simple microscope possessed inherent advantages over the compound microscope.

Compound Microscope. The compound microscope consists of two widely separated systems, the objective and the eye-piece, as shown in the accompanying figure. The objective is the system nearer the object and is always corrected for chromatic aberration, spherical aberration and coma. When the



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MICROSCOPE

objective is corrected for three portions of the spectrum it is termed *apochromatic*. The eye-piece acts like a simple magnifier to magnify the real image which is formed by the objective. By dividing the magnification between the two portions of the system, greatly superior optical performance is secured.

For high magnification, the object must be brightly illuminated. Transparent objects are illuminated by a condensing optical system which sends a cone of light through the object. Opaque objects are illuminated by an optical system which concentrates the light on the object from above. The eye-piece and objective are mounted at the two ends of a tube which is carried on a rack-and-pinion focusing mechanism. Commonly, two focusing systems are provided, one for coarse adjustment, the other for the final adjustment. The object is supported by the "stage"; a mechanical stage is provided with a movement by which the object can be conveniently moved to bring different parts into the field of view. A polarizing, or petrographic, microscope is one provided with equipment for viewing the object by polarized light (*see* POLARIZATION OF LIGHT).

Resolution. The fineness of detail which can be distinguished with a microscope is determined by the limit of resolution. The limit of resolution is the linear distance between two points in the object which can be just distinguished as separate points. For a microscope objective, the limit of resolution is $\lambda/2$ N. A. The wave-length of the light used is λ and the numerical aperture, written N. A., is $n \sin u$. The index of refraction of the medium in front of the objective is n and sin u is the sine of the angle, at the axial object point, between the axial ray and the extreme ray which just passes through the edge of the objective. The limit of resolution is imposed by the physical nature of the light and sets a natural limit to the magnification which can be usefully employed. The limit of resolution may be decreased and, hence, a higher magnification made useful by decreasing the wave-length, i.e. by using ultra violet light; by increasing the value of n as in the oil immersion objective; and by increasing the value of u as in objectives of large aperture. The maximum value of N. A., which is obtained with an oil immersion objective, is 1.60, and, with this N. A., the maximum useful magnification with visible light is approximately 1,800 diameters.

I. C. G.

BIBLIOGRAPHY.—Conrad Beck, *The Microscope*, 1921.

MICROSCOPIUM (gen. *Microscopii*), the microscope, a small constellation directly south of Capricornus, containing no stars brighter than the fourth magnitude. *See* STAR: *map*.

MICROSCOPY, the use of the MICROSCOPE. Different types of objects require different types of illumination. Transparent objects, such as sections of animal and vegetable tissue, are viewed by means of light coming directly through the object. It is often desirable to use dark-ground illumination when investigating striations, inclusions, veins, or other characteristic features of objects. Here, the light coming through from below the object is directed at such an angle to the line of vision that the object appears bright upon a dark background. Opaque bodies must, of course, be viewed by reflected light. Surface colors are best seen when illuminated from above by vertical or ring illuminators. For studying surface

structure, light is projected onto the surface at almost grazing incidence. Certain crystals and fibers affect the character of the light passing through them or reflected from them, and much information can be obtained by viewing them by means of polarized light (*see* POLARIZATION OF LIGHT), using a petrological microscope.

The RESOLVING POWER of a microscope increases with decreasing wave-length of the light used, and, hence, structures too small to be resolved by visible light may often be revealed by photography, using quartz optical parts in the microscope and ultra-violet light for illumination. This method of *ultra-violet microscopy* is exceedingly important in revealing bacterial structure and in metallurgical work in obtaining the detailed structure of alloys.

It is a physical fact that any particle, no matter how small, scatters light falling upon it, the amount scattered being a maximum in directions perpendicular to that of the incident light. The ultramicroscope makes use of this fact, employing an intense dark-ground illumination with visible light. If sufficient light is available, particles much too small to be resolved will be visible as bright discs, although their form cannot be ascertained. This method is very useful in detecting and estimating the numbers of extremely small particles present. T. S.

BIBLIOGRAPHY.—S. H. Gage, *The Microscope and Microscopic Methods*, 1925; C. Beck, *The Microscope*, 1925; J. Belling, *The Use of the Microscope*.

MICROSCOPY, CHEMICAL, the application of the microscope to the solution of chemical problems (not to be confused with "microchemistry," although partially included within this latter field—"the chemistry of minute amounts of material").

Chemical microscopy has evolved by the selection and adaptation of preexisting microscopical methods, and the development of new technique and apparatus, for the direct study of materials and processes in chemical research and technology. It comprises: micrometric measurements and determinations of particle-size; quantitative analyses of mixtures, either by counting particles of the ingredients present or by measuring their relative areas; identifications by distinctive structural appearances, of foods, drugs, textiles, papers; determination of refractive index and study of double refraction of microscopic objects, especially crystals; qualitative analyses of minute samples, by means of precipitates having characteristic form; "close ups" of laboratory and plant operations, and their correlation with chemical and physical behavior.

The apparatus used includes: the "chemical" microscope, equipped for studies with polarized light; the ultramicroscope, for the study of submicroscopic structures and colloids; photomicrographic cameras; micrometers and mechanical stage for measurements and counting; heating and cooling stages; microtomes for cutting thin sections. C. W. M.

BIBLIOGRAPHY.—Chamot and C. W. Mason, *Handbook of Chemical Microscopy*, 1931; Hanausek-Winton, *Microscopy of Technical Products*, 1916.

MIDAS, in Greek mythology, son of GORDIUS and CYBELE, and king of Phrygia. Dionysus (*see* BACCHUS) as a reward for kindness shown SILENUS, promised to grant Midas any favor. The king asked that everything he touched be turned to gold, but when his food turned to gold, he begged to have the favor taken back. Dionysus ordered him to bathe in the River Pactolus whose sands thereafter became golden. The king, once asked to judge a contest between the music of Apollo's lyre and Pan's or Marsyas's flute, decided in favor of Pan, for which Apollo gave Midas asses' ears.

MIDDELBURG, capital of the province of ZEELAND, Netherlands, located on the Island of Walcheren, connected to the Zeeland rivers and the North Sea by wide canals with Flushing and Veere. Among the public buildings are the city hall built in late-Gothic style by Charles the Bold, the municipal museum, the former St. Mary's Abbey, now the seat of the provincial government, and the former abbey church. In early days there was an extensive trade with East India, the West Indies and the Levant, but the present transatlantic traffic is unimportant. The inland trade is considerable, as is the cotton industry. Besides schools, Middelburg contains the Zeeland Scientific Society and two natural history societies. Est. pop. 1927, 19,023.

MIDDLE AGES, a term employed to designate the period between the 4th and the 16th centuries in European history, though there is no real agreement among historians regarding the date either of its beginning or of its end. The term was first employed by the Humanists of the 16th century to indicate long centuries of stagnation which lay between the brilliance of classical civilization and the rebirth of that culture and the reawakening of the individual in the Renaissance of the 15th century. In this view the "Middle Ages" is synonymous with the "Dark Ages." Culture was lost; life was stagnant; men were incapable of creating or appreciating beauty; their spirit was crushed beneath the weight of an authoritarian church. To the outstanding architectural achievement of the Middle Ages was applied the term Gothic in order to indicate its barbarous transgression of the canons of form laid down by the Greeks.

Starting from such premises men divided the history of Europe and western Asia into ancient, medieval and modern periods, indicating with definiteness their territorial and chronological limits, and characterizing each by what were presumed to be their outstanding qualities. During the last hundred years such classification has lost much of its meaning. As archaeological studies have demonstrated that the life of man on this earth must be measured in many thousands, if not millions, of years, the former periodization is seen to possess little validity. In comparison with the length of time the earth has been inhabited by man the span between Aristotle and Dewey shrinks into insignificance. Judged by this long view they are practically contemporaries.

It becomes apparent, therefore, that the traditional historical periodization conforms to no logical divisions in time.

And indeed the whole notion of periodization has suffered modification. The stream of history knows no breaks. It flows ever onward, sometimes swiftly, at times meandering slowly through level meadowland. Historical events are always in process of becoming. It may be legitimate to speak of an age as characterized by outstanding personalities, events or institutions, as the "Age of Louis XIV," the "Period of the French Revolution," of even the "Feudal Age." But to attempt to characterize a period of a thousand years in length is difficult and hazardous.

Specifically in connection with the Middle Ages men have attempted to justify the name by showing that it was clearly marked between the fall of Rome, 476, and the fall of Constantinople, 1453, or the discovery of a new world, 1492; or that it was characterized by a single creed and a dominant institution, the medieval Church; or that it was pervaded by a peculiar psychological attitude which marked it off from that which went before and came after. It was therefore "middle" or "dark" or the "age of faith." Students are, however, becoming increasingly critical of such sweeping generalizations as these theories imply. They no longer seek logically to justify the term, but retain it merely as a convenient peg upon which to hang their historical synthesis. Middle and dark and an age of faith the period was at certain times and in certain of its aspects, but it presents too rich, complicated and shifting a scene to be summed up in a single phrase.

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MIDDLEBOROUGH, a town including Middleborough and several other villages, in Plymouth Co., southeastern Massachusetts. Middleborough village is situated about 30 mi. southeast of Boston and is served by the New Haven Railroad, and by bus lines. There are numerous industries, shoemaking being the most important. Cranberries and apples are the leading crops. Middleborough has benefited by the public library and other civic institutions built by Thomas Sprout Pierce and the trust fund which he left. The town was settled in 1660 and incorporated in 1669. Pop. 1920, 8,453; 1930, 8,608.

MIDDLEBURY COLLEGE, at Middlebury, Vt., a coeducational and non-sectarian college established in 1800. The first class was graduated in 1802, when the first academic degrees conferred in Vermont were bestowed. Painter Hall, erected in 1815, and still in use, is one of the best examples of early collegiate architecture. The college had productive funds in 1931 totaling $4,261,095. The library contained approximately 60,000 volumes. In 1931-32 there was a student enrollment of 672, and a faculty of 60 headed by Pres. Paul Dwight Moody.

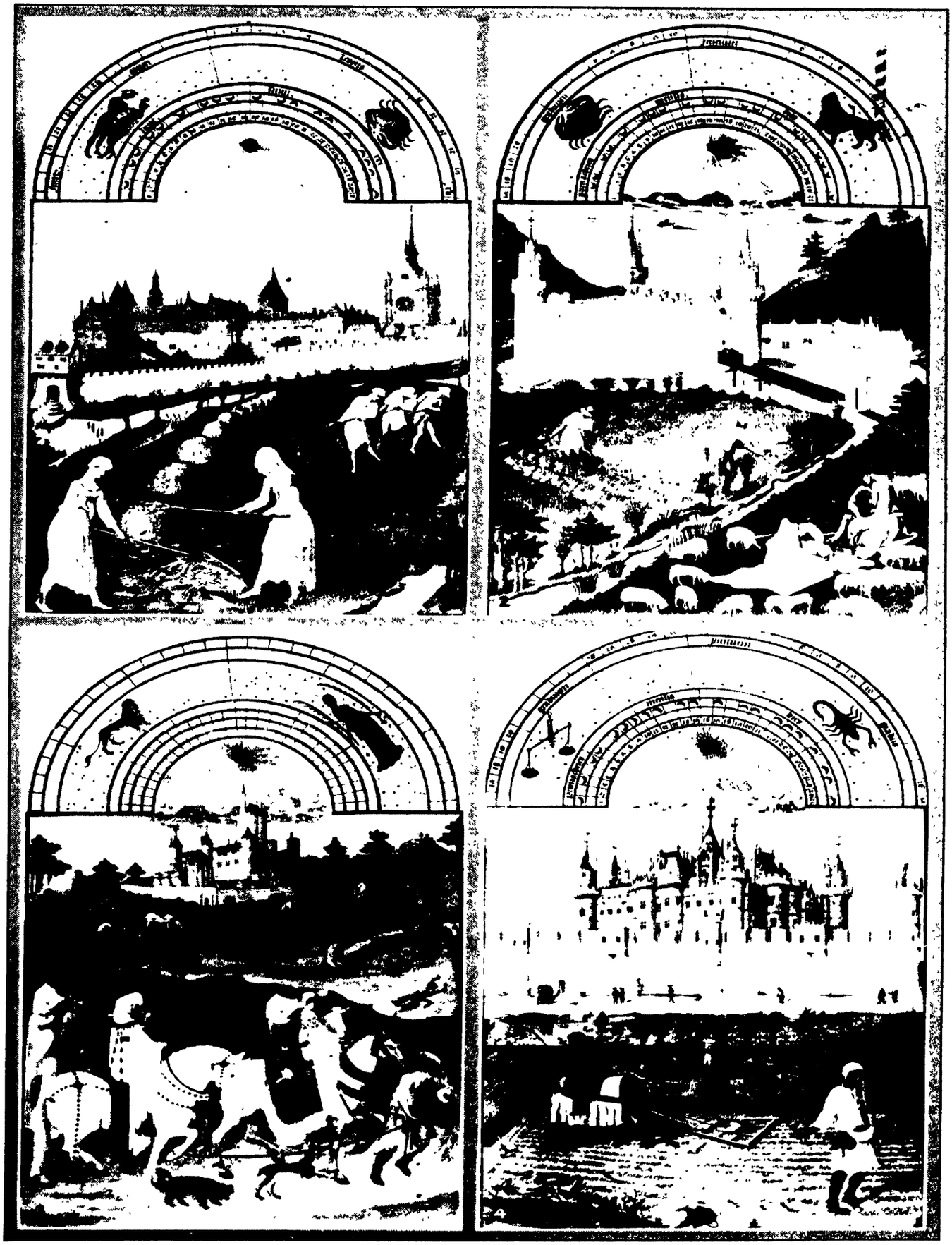
MIDDLESBORO, a city of Bell Co., Ky., situated in the southeastern section of the state. It lies in the Cumberland Mountains at an elevation of 1,200 ft., surrounded by ranges rising to 3,100 ft. Served by two railroads, Middlesboro is largely residential, but its industries include coal mines, an overall factory and a tannery. The retail trade in 1929 amounted to $4,143,369. Middlesboro was founded in 1889 and incorporated as a city in 1890. Pop. 1920, 8,041; 1930, 10,350.

MIDDLESBROUGH, a municipal county borough in the North Riding of Yorkshire, England, on the Tees estuary, 5 mi. from its mouth in the North Sea and 238 mi. northwest of London. Highly industrialized, it is the center of the Cleveland iron district, occupying the land granted in 1130 to the Abbey of St. Hilda, a fragment of which is incorporated to-day in a brewery wall. The modern growth of Middlesbrough has been rapid. An insignificant hamlet in the early 19th century, it became a real estate development, and throve with the advent of railways, gas and by 1851, blast furnaces. The river affords easy transportation to the coal, limestone and ironstone of the region, and the two breakwaters at the river mouth are over 2 mi. and 3,330 ft. long, respectively. In 1926 the docks were enlarged to some 26 acres. Steel and iron working is of first importance, and there is a flourishing shipping trade. Pop. 1921, 131,070; 1931, 138,489.

MIDDLETON, ARTHUR (1742-87), American patriot, was born at Middletown Place, Ashley River, S.C., June 26, 1742. He was educated at Hackney, Westminster and Cambridge in England, and returned to America to establish himself as a planter. He became one of the leaders of the Revolutionary party, was on the first council of safety, and in 1775 was sent to the Provincial Congress. He was a delegate from South Carolina to the Second Continental Congress in 1776, and signed the Declaration of Independence. He afterward was elected to the state senate. He died at Goose Creek, S.C., on Jan. 1, 1787.

MIDDLETON, THOMAS (c. 1570-1627), English dramatist, was probably born in London about 1570. His earliest surviving independent play was *Blurt, Master Constable,* 1602. In writing for Henslowe and others he furnished the usual collaboration for about 23 plays which are extant, and probably for a great many that are lost. His *Game of Cheese,* 1624, satirized the court, and he and his actors were fined. He frequently wrote pageants on civic occasions, and his masque, *The Changeling,* acted in 1623 and printed 30 years later, is one of his outstanding works. His most successful collaboration was that with William Rowley, which included *A Fair Quarrel* and *The World Lost at Tennis.* He wrote several comedies of London life, such as *Women Beware Women,* in which he is milder and more tolerant than Dekker. In 1620 he was made city chronologer. He died at Newington Butts, July 4, 1627.

MIDDLETOWN, a city in south-central Connecticut, the county seat of Middlesex Co., on the Con-



LIFE IN THE FIELDS IN THE MIDDLE AGES

Four miniatures by Paul de Limbourg from "Très riches Heures du duc de Berry," the famous prayer book of Chantilly, now in the Musée Condé. Harvesting, sheep-shearing, cultivating and sowing go on in the castle fields. **1**, June; **2**, July; **3**, August; **4**, October.

necticut River, 15 mi. south of Hartford. The city is an inland port served by coastwise steamships, bus and truck lines and the New Haven Railroad. Middletown is located in the rich corn growing area of Connecticut, in the highly industrialized section. The chief manufactures are machinery, textiles, hardware and other metal products. There are also shipbuilding yards. In 1929 the factory output reached an approximate total of $20,000,000; the retail trade amounted to $12,592,222. The site was an Indian village, purchased by the white settlers in 1650, under the name of Mattabesett. Middletown was incorporated in 1784. Pop. 1920, 13,638; 1930, 24,554.

MIDDLETOWN, a city of Orange Co., southeastern New York, about 65 mi. northwest of New York City; it is served by the Erie and the New York, Ontario and Western railways and motor busses. Located amid beautiful scenery in a summer resort section 700 ft. above sea level Middletown is surrounded by fertile farming and dairy products country. There are railroad shops here and manufactures include machines, hats, clothing, leather, boxes, silk, tools, flavoring extracts, toilet articles, ice cream and soft drinks. In 1929 the approximate value of manufactures was $5,000,000; the retail trade amounted to $15,946,929. A state homeopathic hospital for the insane is located here. The first house on the site of Middletown was built about 1756 and the first church organized in 1785. Its name was derived from its halfway position on Minisink road to western New York. The village was incorporated in 1848 and the city chartered in 1888. Pop. 1920, 18,420; 1930, 21,276; about 10% were foreign-born.

MIDDLETOWN, a city of southwestern Ohio, in Butler Co., situated on the Great Miami River, about 23 mi. south of Dayton and 34 railway mi. north of Cincinnati. The transportation facilities include the Baltimore and Ohio, the freight division of the Pennsylvania and the Big Four railroads, bus lines and an airport. The fertile surrounding country yields tobacco, wheat, Indian corn and other crops. Middletown has large steel plants and paper mills, power for which comes from the river. In 1929 the value of manufactured products was about $44,000,000; the retail trade amounted to $15,593,248. Middletown owns and operates its own water works. The site of the city was first permanently settled about 1791 by Daniel Doty and other pioneers; in 1802 it was laid out and named in reference to its location nearly midway between Cincinnati and Dayton; in 1837 Middletown was incorporated as a city. Pop. 1920, 23,594; 1930, 29,992.

MIDDLETOWN, a borough in Dauphin Co., southeastern Pennsylvania, situated on the Susquehanna River, nine mi. southeast of Harrisburg. It is served by two railroads. The Army Air Corps has a depot here. Middletown is in good farming country. The borough has steel mills, boiler works and shoe, hosiery and furniture factories. It was founded by Scotch-Irish and Quaker settlers in the middle of the 18th century. Middletown, situated halfway between Lancaster and Carlisle, was incorporated in 1828. Pop. 1920, 5,920; 1930, 6,085.

MIDDLINGS, in ore treatment, refers to the product of a concentrating process which is neither waste tailings nor valuable concentrate, but intermediate in value. It usually requires further crushing and treatment to effect a good separation of the ore from the gangue. *See also* ORE TREATMENT.

For flour middlings, *see* FLOUR; for cotton middlings, *see* COTTON.

MIDGE, a name properly applied only to small mosquito-like flies of the family *Chironomidæ.* The adult midges have long, delicate legs, narrow wings and plume-like antennæ. Most of them are harmless. A few species, however, are extremely annoying because of their bites. These are known as punkies or sandflies, and are often abundant along mountain streams. The larvæ of most true midges are aquatic, but some live in decaying vegetable matter, under bark or in the ground. The aquatic forms often live in tubes which they build of dead leaves and sand, fastened together with silken threads. Many of these are blood-red in color, and are known as blood-worms. The larvæ and pupæ of the aquatic forms are of very great importance as food for fishes. Swarms of adult midges are often seen dancing in the air or near streams.

The term midge has also been applied to various species of gall gnats, among which are some that seriously damage cultivated crops. Clover leaves are attacked by one species, the flowers of a second, and the immature seed by a third. No remedy is known for the first. Clipping back the plants to retard blossoming controls the other two. Immature kernels of wheat, oats and rye are destroyed by another species. This may be controlled by early fall plowing and burning the stubble. Sorghum heads are similarly attacked. For control, destroy johnson grass and sorghum refuse. Grape blossoms fall prey to still another midge, which may be destroyed by nicotine spray. Young pears are stunted by another species. The HESSIAN FLY is a related species. J. R. T.

MIDLAND, a port of Simcoe County, Ontario, Canada, situated on Georgian Bay, at the mouth of the Trent Valley Canal, 90 mi. north of Toronto. It is a terminal for the Canadian Pacific and Canadian National railways with an excellent harbor, through which lumber, and the manufactures of local flour, woolen and planing mills, foundries and wood-working plants are exported. Shipyards are located here. Midland is a favorite tourist resort. Pop. 1921, 7,016; 1931, 6,920.

MIDLAND, a city in central Michigan, the county seat of Midland Co., situated on the Titabawassee River, at the mouth of the Pine and the Chippewa rivers, about 15 mi. west of Bay City. Bus lines and two railroads afford transportation. The chief crops of this region are sugar beets and chicory. Coal, oil, and salt brine are found in the vicinity. The city has various manufactures, chemicals, made from the brine, being especially important. Midland

was incorporated in 1887. Pop. 1920, 5,483; 1930, 8,038.

MIDLAND, a borough in Beaver Co., on the western boundary of Pennsylvania, situated on the Ohio River about 30 mi. northwest of Pittsburgh; it is served by the Pennsylvania Railroad. Midland is a manufacturing community. Pop. 1920, 5,452; 1930, 6,007.

MIDLAND, a city in western Texas, the county seat of Midland Co. It is situated 150 mi. southwest of Abilene and is served by the Texas and Pacific Railroad. There is an airport. The industrial and commercial importance of the city is attributable to the oil produced in the region. Pop. 1920, 1,795; 1930, 5,484.

MIDNIGHT SUN, a phenomenon visible in very high latitudes, where it is possible during the summer for the sun to remain above the horizon for several days without setting.

MIDRASH (plural, Midrashim, from the Hebrew verb *darash,* "to explain," "to investigate"). Originally the term meant the homiletical method of interpreting the Scriptures; later, the designation for a number of Hebrew books which contain anecdotes, legends and sermons based on interpretation of the Scriptures. They contain stories, sermons, homilies and moral illustrations, told either for the purpose of explaining a difficult Biblical passage, or for that of pointing out a certain moral lesson. Since the Bible was regarded as divine, as containing all truth, as being eternally valid, it was believed that every new situation which confronted man, every new principle which was required, every new teaching which was found necessary, must be provided for in the Bible and could be derived therefrom by means of the explanation and interpretation of the Biblical text.

Midrashic books first came into existence about 200; in later days 100 such works were reckoned. In most of them the Haggadic (legendary and narrative) and Halachic (legal) elements are not sharply differentiated. Those Midrashim which contain much Halachah as well as Haggadah are called the Halachic Midrashim; the most important of these are the Mechilta, to the book of Exodus; the Sifra, to Leviticus, and the Sifre, to Numbers and Deuteronomy. The Haggadic Midrashim are those books which contain every manner of narrative, tale and moralizing and edifying material; these generally follow the order and homilies of the Biblical narratives. The Midrashic books to the Pentateuch and the Five Scrolls: Ruth, Song of Songs, Ecclesiastes, Lamentations and Esther, are generally called Midrash Rabbah or The Great Midrash. In addition, there are two so-called Midrash Tanhumas, as well as Midrashim to Samuel, Psalms and Proverbs; there are also smaller Midrashim. *See Jewish Encyclopedia.*

It appears certain that the great Haggadic Midrashim, the books of the Midrash Rabbah and of the Midrash Tanhuma, were written in various strata, the first stratum in the period of the Amoraim, the successors to the Tannaim or teachers of the Mishnah, in Palestine, and the later strata in the Gaonic period in Babylonia. A. Sh.

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MIDSHIPMAN, the title in the United States Navy given to students undergoing the course at the U.S. Naval Academy, preparatory to entering the lowest commissioned grades of the Navy or Marine Corps. A midshipman is an officer, in a qualified sense. Navy laws do not admit him to longevity pay or retirement rights. He may, in emergency, be ordered to sea in addition to his practice cruises. A midshipman is junior to a commissioned warrant officer and senior to a warrant officer. The term midshipman originated from the part of the ship assigned to the young gentlemen, as they used to be called in older navies; i.e., amidships or abreast the mainmast. *See also* Cadet.

MIDSUMMER NIGHT'S DREAM, A, a capricious fairy play by Shakespeare, indebted somewhat to *The Knight's Tale* in Chaucer; printed 1600. One night four mortals, in flight from Athens, fall asleep in the same forest and are enchanted by a juice which Puck, the wilful emissary of King Oberon and Queen Titania, drops upon their sleeping eyes. After innumerable entanglements and fantastic adventures, not the least of which are Titania's bewitchment with Bottom, the weaver, and the antic diversions of Snout, the joiner, the loves of the four mortals are cleared of all former obstructions, making Hermia happy with Lysander, and Demetrius with Helena. Among other incidental entertainments is a little play of Pyramus and Thisbe performed by a group of rustics and artisans.

MIER, FRAY SERVANDO TERESA DE (1763-1823), Mexican priest and patriot. Influenced by the writings of Voltaire and Rousseau, he declared in the course of his sermon at the annual celebration of the Virgin of Guadelupe, that the supposed appearance of the Virgin at that place was false. He was excommunicated and for several years wandered in France, Italy and England, suffering severe persecutions. During this period he began to advocate the independence of Mexico, and attempted to return to Mexico, but was captured and exiled, going first to Havana, and later to the United States, where he lived until the independence of Mexico permitted his return to that country. He took an important part in the debates leading to the formulation of the first Republican Constitution in 1824. His greatest contribution to Mexican independence was his writing, his most important work being *Cartas de un americano a un espanol.* Mier died in 1823.

MIFFLIN, THOMAS (1744-1800), American soldier and public official was born in Philadelphia in 1744. He entered public life in 1772 as a member of the Pennsylvania Assembly, and in 1774 was elected a delegate to the first Continental Congress. He was first aide-de-camp to Washington at Cambridge, and was promoted to major-general in 1777. He was

elected to Congress in 1782 and became President of that body in 1783; was speaker in the Pennsylvania Legislature in 1785; delegate to the Constitutional Convention in 1787, and the first state Governor of Pennsylvania, 1790-99. He strongly favored the Federal Constitution and as Governor during a decade of bitter antagonism between the Federalists and their opponents he was a source of strength to the Federalists. As commander of the Pennsylvania militia he aided in suppressing the WHISKEY INSURRECTION of 1794. He died in Lancaster, Pa., Jan. 20, 1800.

MIGNON, an opera in three acts by AMBROISE THOMAS, libretto after Goethe's *Wilhelm Meister* by Barbier and Carré; première, Paris, 1866, London, 1870, New York, 1871. Thomas composed a number of operas, but only two, *Mignon* and *Hamlet,* were popular successes, and the former alone found wide favor.

Wilhelm, a traveling student, is passing through a small German town. A gypsy band is to give a performance. When Mignon refuses to perform, she is beaten by the gypsy leader, Giarno, and Wilhelm rescues her, purchasing the girl's release with a handful of money. As he already has been invited by Filina to accompany her theatrical troupe to the castle where it is to perform, Wilhelm takes Mignon along as his servant. Jealousy of Wilhelm's interest in Filina leads Mignon to say that she hopes the castle will be struck by lightning. Hearing this wish, the wandering half-witted minstrel, Lothario, sets fire to the building and Mignon is saved by Wilhelm. Lothario takes the girl to Italy to nurse her back to health, and there Wilhelm joins them. The new scene agitates Lothario whose memory of it is suddenly restored. He had formerly lived there as a noble, and his daughter Sperata had vanished. The loss had unseated his reason. Now he begins to recall the circumstances; and when at last he hears Mignon recite a prayer he had taught his daughter in childhood, his senses completely return. Mignon is his lost daughter. Wilhelm meanwhile has completely forgotten Filina, and when Mignon is well they are happily married.

MIGNONETTE (*Reseda odorata*), a low branching annual of the mignonette family (*Resedaceæ*), long and widely grown for its highly fragrant flowers. It is a native of northern Africa which, through cultivation, has become greatly modified into numerous forms varying greatly in size and habit. The short stem, erect at first, but soon becoming decumbent, bears oblong, sometimes notched leaves and dense, narrow, terminal clusters of yellowish-white flowers.

MIGRAINE, a type of headache characterized by attacks recurring over a long period of years, also known as sick headache, megrim or hemicrama. A hereditary background is usually present, often in the form of this or other neurosis in the direct or collateral ancestors. Females are more commonly afflicted than males.

The attacks may be precipitated by periods of excessive nervous strain such as may result from close mental work, emotional excitement, eye strain or insufficient sleep, digestive disturbances, or constipation. Attacks may come on spontaneously and are believed due to a variety of causes:

Anatomical malformations in the floor of the skull or cortex of the brain have been assumed to be the cause in some cases of migraine. *Physiological changes,* particularly spasms of the small arteries in the brain, are considered by some to be the direct cause of the attacks. More recently the possibility of *changes* in the intricate *chemistry of the cells of the body* has been considered as a causative factor, which view has been strengthened by profound changes in the amount of certain blood constituents during the attacks.

Finally, migraine attacks appear often to be dependent upon the same factors as attacks of asthma, namely, *sensitization to a specific protein* in the food. Probably a single cause is not guilty in all cases.

The attacks begin in childhood or youth, though rarely they may come on after 30 years. They recur for many years, often ceasing spontaneously in the forties, fifties or sixties, although they may continue throughout life. General good health is the rule between attacks.

A typical attack may be divided into three stages, premonitory, the period of headache, and the abatement. The premonitory stage is marked by subjective symptoms, such as fatigue, depression, chilliness, vertigo, disturbances of vision or sensation, or rarely, a sense of exceptional well being. Shortly before the onset of pain a luminous spot may appear in the field of vision, gradually enlarging and taking on a zigzag outline with a brilliant display of colors at the margin. Associated with this phenomenon the vision is blurred. The pain, described as dull ache, throbbing or boring in character, may develop suddenly or gradually. It usually begins in the region of one eye and may remain localized or spread to involve half of the head, both eyes, or the entire head. Less commonly, it begins in the occipital region. When the entire head is involved, the pain is usually more severe on one side. It is increased by bright lights, noise, stooping, or mental effort, and is often associated with tenderness to touch over the eyeball or the scalp. The pain and discomfort progresses until nausea and vomiting occur, with more or less rapid relief.

Associated with the attack may be such symptoms as diarrhea, pallor, chilliness and cold extremities, often alternating with flushing and sensation of warmth, disturbances of vision, speech and mental processes, sweating, salivation and nervousness. With the subsidence of the attack, drowsiness and deep sleep may occur from which the victim awakens refreshed or with a slight residual fatigue. The entire attack may last from a few hours to several days, and may run through the classical course or only one of the stages. G. M.

MIGRATION, the orderly shifting of animals in obedience to a racial instinct; also used of population shifts due to change of climate, overcrowding or other

exterior influences. True migration, most strikingly exemplified by birds, is periodic, occurring at a definite season or point in the life cycle, and is hereditary, the young often acting without the example of their elders. This eliminates occasional shiftings such as plagues of grasshoppers, army worms or squirrels, or the curious, blind drives of Scandinavian lemmings. Among higher animals, migrations are limited by the slow progress of large groups over land. However, the seasonal north-to-south swing of the American bison and its reverse, and the annual southward movement of Arctic caribou, may be called migrations.

The most important instance among mammals, however, occurs in seals, which breed in the Pribilof Islands, leave there when the pups are old enough to travel, winter along the North American Pacific coast and in the spring return 2,000 miles to the Islands to bear their young. Turtles, toads and land crabs also seek certain localities to breed, often traveling surprising distances, while certain fishes migrate for breeding and spawning. Most remarkable among these are the drives of salmon, quite different from mass movements of fish in search of food. Salmon eggs are laid in a gravelly river bed, where the young fishes stay some time and then seek the sea. Here they may swim for years until the urge to spawn drives them to fresh water. It has been proved repeatedly that mature salmon return to the river of their birth and ascend it despite enormous difficulties. Eels also will cross the ocean to ascend their native rivers, spawn and die.

The most important migratory creatures are birds. Although few species migrate, those that do are widespread, and their remarkable flights have been the subject of constant scientific study. The picarian and passerine birds migrate most extensively, gulls, terns, geese and ducks being leading examples. Perhaps two-thirds of all birds in the middle temperate zones migrate, but their movements are not as definitely seasonal as is sometimes thought. Variations by species and by individuals cause migrations to be spread out over almost the entire year. Although weather conditions usually influence the starting date, the strength of the instinct is shown by the fact that migratory birds start south before winter, regardless of the weather.

In autumn migrations, birds gather gradually, centralizing along air highways or migratory routes, and sweep south in great masses, many of them actually overshooting the equator to reach temperate zones on the other side. Then toward the close of the tropical rainy season, the flocks take off for the north, traveling usually by night. Again their flights follow well-known routes, generally determined by ocean coasts and river valleys. There is a Pacific coast route and one on the Atlantic, and along the border lowlands and from the West Indies, flocks enter the United States to follow the Mississippi and its tributaries, or to go up the Hudson. A flight of 200 miles in 24 hours is not exceptional, whereas those across large bodies of water are often longer.

By means of legbanding, scientists have been able to chart the routes of certain specimens and to time their flights. It is now believed that keen vision rather than instinct accounts for the accuracy with which birds find their way to previous haunts. But science is still unable to explain the basic migratory instinct, or to explore the details of these periodic journeys.

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MIKADO, the term used by foreigners, but not by Japanese, to designate the Emperor of Japan. The Japanese term is *Tenno*. The Japanese imperial line, according to tradition, started with Jimmu Tenno who founded the Japanese Empire in 660 B.C. Jimmu was reputed to be a direct descendant of the sun goddess. The Emperor Hirohito is the 124th in the direct line from Jimmu.

MIKADO, THE, a comic opera by SIR ARTHUR SULLIVAN, libretto by W. S. GILBERT; première, London and New York, 1885. It is one of the most melodious of the dozen operettas on which Gilbert and Sullivan collaborated, and won almost instantaneous success in the United States and England, rivaling that of its famous predecessors, *H.M.S. Pinafore, The Pirates of Penzance* and *Patience*.

The son of the Mikado, emperor of Japan, is Nanki-Poo. To escape marrying Katisha he has run away from court, disguising himself as a wandering minstrel. He is in love with Yum-Yum, whose guardian is Ko-Ko, the Lord High Executioner. Despite his imposing title, Ko-Ko was originally a tailor. He is a mild-mannered man in addition, and has not the heart for his work. The Mikado demands a first-class execution within a month, otherwise Ko-Ko will be discharged from his position. Pooh-Bah meanwhile has apprised Nanki-Poo of Ko-Ko's predicament and of his love for Yum-Yum whom he himself hopes to marry. Nanki-Poo comes to the rescue by offering himself as a victim provided he be allowed to marry Yum-Yum and live with her one month before the ax falls. This offer Ko-Ko accepts gladly. However, he discovers that the wife of an executed husband must, according to law, be buried alive. Although Nanki-Poo now offers to commit suicide, that plan is discarded: it would not help Ko-Ko. Consequently, a false report of Nanki-Poo's execution is published. The Mikado is furious and tells Ko-Ko that he has killed the heir to the throne. The executioner, to pay for his mistake, must be boiled in oil. Fortunately, Nanki-Poo turns up, has a royal wedding with Yum-Yum, while Ko-Ko, thankful to be alive, marries Katisha.

MIKASUKI, a division of the Seminole Indians speaking the Hitchiti dialect of the Muskhogean linguistic stock. The name also applies to a former Seminole town in Leon Co., Fla. The Mikasuki appear to have been emigrants from the towns on the Lower Chattahoochee River, Ala. The Mikasuki were leaders of the hostile Seminole in their wars against the United States.

MIKLAS, WILHELM (1872-), President of Austria, was born in Austria in 1872. He was director of a high school gymnasium before entering politics, and lived in the village of Horn. In 1923-28, he presided over the National Assembly. On Dec. 5, 1928, he was elected president of the republic of Austria, on a minority vote, the result of a deadlock between the Socialists and the Clerical Party.

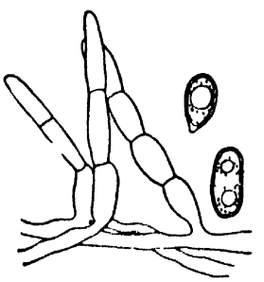
MILAN, one of the largest cities in Italy, and the country's chief financial, commercial and industrial center. It is situated in the plain of Lombardy about 30 mi. from the Swiss border. Its celebrated Gothic cathedral is one of the world's largest churches, and the opera-house, the famous La Scala, is the second largest among European theaters. Milan possesses one of the world's most famous masterpieces, *The Last Supper* of LEONARDO DA VINCI, painted on the refectory wall in the convent of the Church of S. Maria delle Grazie. The Brera Art Gallery is also world-famous. Among other interesting features of the city are the imposing 15th century castle of the powerful Sforza family, and the Romanesque Church of S. Ambrogio. The latter replaced the 4th century church where St. Augustine was baptized by Milan's great bishop, St. Ambrose. Milan became a center of the arts under the Sforzas, in the late 15th century. It was already important industrially, wool and silk spinning and weaving, particularly, having prospered since the 12th century. The present city is the center of Italy's great silk industry; gloves and straw hats are other important manufactures; cotton, linen, and wool are spun and woven, and the rayon industry is growing. Milan is well known for electric cables, chemical products and locomotives, turbines, and heavy machinery. Most of the industrial power is hydroelectrical. Pop. 1931, 992,036.

History. Although an ancient Celtic and Roman city (Mediolanum) and a religious center under the late Empire, Milan had little political importance of its own until the 11th century. In the beginning of the century it was an imperial duchy ruled by the Este family, but the outbreak of the Pataria in 1056 resulted in bringing the lower classes into power and turning Milan into a republican city-state. The Pataria movement began as an attack upon the clergy and an attempt to reform church abuses, but it gradually developed a decidedly anti-imperial slant. Although the party itself was crushed in 1075, Milan remained definitely a Guelph city and during the 12th century faced the German emperors as the focus of the LOMBARD LEAGUE. In this struggle it was destroyed by Frederick I in 1162, but was rebuilt in 1167 and forced official recognition of its self-government from the Emperor in 1183.

Industrial progress during the 12th century was rapid, particularly in the development of the armor and wool trades. During the 13th century the manufacture of silk was introduced and Milan became the great silk center of Europe. With the increase of industrial wealth the old republican Government became increasingly oligarchic, and the rise of patrician and oligarchic groups gradually led to a complete decay of republican forms.

MILAN, CATHEDRAL OF, one of the monumental religious edifices of Europe, was begun in 1386, by Giovanni Galeazzo and confronts the Piazza del Duomo, or cathedral square, in Milan, Italy. So many additions have been made in later centuries that while in general style the architecture is Gothic, it is distinctive of no one period. The immense structure, whose exterior is of marble, occupies an area of about 3 acres. In shape it is cruciform with double aisles in the transepts. The roof is upheld by 52 pillars provided with niches for statues in place of the conventional capitals. On the outside of the roof are a great number of turrets with slender spires and over 4,000 statues representative of various periods.

MILDEW, a term applied to a fungus growth on the surface of almost any object. Thus a piece of cheese, a bit of stale bread, a leather cushion or a paper wrapper are said to be mildewed when fungi of one or more kinds appear on their surfaces. The term is used in a somewhat more restricted way to describe the superficial growth of certain fungi on the stems and leaves of living plants. The parasitic mildews are of two kinds, the downy mildews and the powdery mildews.



POWDERY MILDEW
rysiphe graminis). Mycelium d erect conidiophores. Right, nidia. The powdery mildew common on wild grasses and wheat

The downy mildews are phycomycetous fungi belonging in the family *Peronosporaceae.* Many of them are destructive plant pathogens. They cause such important and well-known diseases as the downy mildews of beans, cabbage, cauliflower, clover, corn, cucumber, grape, lettuce, onions, pumpkin and spinach. One of the most important species in this family is *Phytophthora infestans,* the fungus causing the late blight disease of potatoes.

The powdery mildews are simple ascomycetous fungi belonging in the family *Erysiphaceae.* They form a web of mycelium, bearing conidiophores and conidia, over the surface of parasitized leaves. There are more than a hundred species, and they cause disease in more than fifteen hundred host plants. Some of the mildews are limited to a single species, while others attack many different species belonging to different genera and families of plants. Although more abundant in temperate zones the *Erysiphaceae* are practically of world distribution. They can only be cultivated on living plant tissues. L. O. K.

MILDEWPROOFING, a chemical treatment, often combined with WATERPROOFING, given to heavy cotton or linen fabrics used for tarpaulins, covers, awnings, tents and sails to protect them from the attacks of rapidly growing spore-propagated forms of low vegetable life known as mildews and molds.

These are broadly of three classes—algae, favored by water, light and air and inhibited by copper salts; mucors, favored by dark and dampness and inhibited by compounds of lead, chromium, iron, and manganese; and cryptogams, including dry rots, favored by drier conditions and limited light and ventilation, and inhibited by tar compounds, naphthalenes, creosotes and tannates.

The acetate-oxide process using lead, chromium, iron and copper is an effective aqueous treatment; and the soaps of similar metals are effectively combined with volatile solvent waterproofing materials. Compounds of arsenic, mercury or osmium are effective but unsafe.

The fabrics to be treated are unbleached and all SIZING should be removed. Mildewproofing is applied as a preliminary aqueous treatment, or by metallic soaps added to solvent waterproofing mixtures. The deposit must be practically insoluble to insure permanency; mineral dyed khaki and cutch dyed (*see* DYEING) brown fabrics are inherently largely mildewproof. Adequate mildewproofing is capable of greatly increasing the service of fabrics. W. H. A.

MILES, NELSON APPLETON (1839-1925), American soldier, was born at Westminster, Mass., Aug. 8, 1839. Raised on a farm, he attended the local schools. He moved to Boston in 1856, where he was working in a store at the outbreak of the CIVIL WAR. He raised a volunteer company, and in Sept. 1861 he was appointed an acting captain, but because of his youth the commission which was issued was that of a first-lieutenant. May 31, 1862 he was commissioned a lieut.-colonel of the 61st N.Y. Volunteers and was promoted to a colonelcy Sept. 30, 1862. He was awarded the Congressional Medal of Honor for distinguished gallantry while in command of his regiment at the Battle of Chancellorsville, May 3, 1863. He was promoted to brigadier general of volunteers, May 12, 1864 for his services during the Battles of the Old Wilderness and Spottsylvania Court House; and for "highly meritorious and distinguished conduct throughout the campaign, and particularly for gallantry and valuable service in the Battle of Ream's Station, Va.," he was made a major-general of volunteers, Oct. 21, 1865. Miles in 1865 commanded an army corps when only 25 years old. After the war he remained in the army, being commissioned colonel of the 40th Infantry, July 28, 1866 and because of his Civil War record he was commissioned a brevet brigadier-general U.S. Army, March 2, 1867, and a brevet major-general as of the same date. From 1869-86, Miles was employed in pacifying hostile Indian tribes, including the Cheyenne, Kiowa and Apache (1875), the Sioux (1876), the Nez Percés (1877) and the Apache (1886), and a further outbreak of the Sioux and Cheyennes (1890-91). He was appointed a brigadier-general (1880) and a major-general (1890). He commanded the troops which were sent to Chicago in 1894 to end the disorder attendant upon the Pullman strike. In 1895, he became the commanding general of the U.S. Army, a position which he held during the Spanish-American War. His principal activity during the war, however, was the unopposed occupation with his troops of Porto Rico, July 1898. He was promoted to the rank of lieutenant-general in 1900 and was retired by law 1903. He was the author of several books of memoirs and of military observations. He died at Washington, D.C., May 15, 1925.

MILES CITY, a city in southeastern Montana, the county seat of Custer Co., situated on the Yellowstone River at the mouth of the Tongue River, about 30 mi. southwest of Terry. Airplanes and two railroads serve the city, which is a shipping market for grain, range cattle, sheep, hogs and wool. Miles City has grain elevators, saddle factories and oil refineries. The United States Range Livestock Experimental Station is situated at Ft. Keogh, near by, built in 1877 by Gen. Nelson A. Miles, founder of the city. George A. Custer was killed near Miles City. Pop. 1920, 7,937; 1930, 7,175.

MILETUS, one of the greatest cities of ancient times, situated on the west coast of Asia Minor. With excellent harbors, it was a power on the seas up to about 500 B.C. and established numerous colonies. Miletus was conquered by ALEXANDER THE GREAT in the 4th century B.C. and later became part of the Roman Empire.

MILFORD, a town and village in Worcester Co., southeastern Massachusetts. The village is situated on the Charles River, about 31 mi. southwest of Boston and is served by two railroads and by bus lines. Shoes, hats and rubber goods are the chief manufactures. The factory output of the town for 1929 was worth about $6,000,000. Milford has truck, dairy and poultry farms, and quarries producing pinkish-gray granite. Once a part of Mendon, the town of Milford was set off and incorporated in 1780. Its shoe industry began in 1795. Pop. 1920, 13,471; 1930, 14,741.

MILITARISM, the maintenance of large military establishments and heavier and heavier armament both on land and sea. The growth of militarism in Europe was particularly marked after 1862. In that year Prussia, under the guiding hand of King WILLIAM I and BISMARCK, introduced compulsory military training for every able-bodied male citizen. The success of the Prussian military machine, both in 1866 and 1871, convinced the other great powers that national defense required similar action. In consequence Austria, Hungary, France, Japan, Russia and Italy all followed the German example. Great Britain did not enter the competition, but turned to a policy of navalism. Originally launched as a policy of national defense, militarism was soon eulogized as a virtue in and of itself, and a "cult of valor" developed. This competition in military preparedness together with the philosophy it engendered contributed much to the dangerous psychological situation in Europe which preceded the World War. S. C. W.

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MILITARY AVIATION. To gain a proper conception of the uses of military aviation it must be realized that the AIRPLANE is not in itself a weapon. It is a means of transportation. When used to carry skilled observers it is called observation aviation. When used to transport weapons of destruction it becomes a part of the air force. It is also used as cargo and troop carriers.

The United States Army Air Corps is organized as a part of the ARMY and embraces both heavier-than-air and lighter-than-air craft. While the characteristics and performance of these two classes of aircraft are quite different, the principles underlying their use are the same, and the discussion of military aviation will indicate the uses of lighter-than-air craft as well. The functions of an air force are determined by its powers and limitations and are the same whether or not the air force is a part of an army or is organized as an independent unit.

Observation Aviation. That class of military aviation which has the mission of obtaining military information is known as observation aviation. It is a part of the intelligence system of an army and is used to gather information not available by any other means. It is organized into SQUADRONS and groups for administrative purposes but operates by individual airplanes. These are armed primarily for self-defense only. There are two types. One is a high-speed, long-range airplane equipped with an aerial mapping camera which penetrates far into enemy territory to gain information of large concentrations of troops and supplies and to map the country. The other is a fast, highly maneuverable airplane equipped with a camera which works in the immediate vicinity of the battle area. Each type reports its information by means of radio, dropped messages, photographs, visual signals and by verbal report of the observer. Observation aviation maintains a photographic record of front lines and of enemy works and dispositions, locates targets and adjusts artillery fire on them, reports enemy movements, locates friendly troops and carries messages to and from them. Observation aviation works for every echelon of command and for all combat branches of the army. It must be prepared to operate both day and night.

Air Force. That class of military aviation which has the mission of applying destructive force from the air against ground objectives and enemy aircraft is called the air force. There are three different branches, bombardment, attack and pursuit. Bombardment, the basic branch, is designed for destruction of ground objectives, as bridges, locks, railroads, factories, supply dumps, airdromes, battleships and airplane carriers. Two general types of airplanes are employed: the light bomber, which carries from 600 to 1,200 lbs. of bombs and is very fast; the heavy bomber, which carries from 2,000 to 4,000 lbs. Both carry machine guns and fly in close formation at high altitudes. Modern bombsights are very accurate and the power and efficiency of bombardment is steadily increasing.

Attack is designed for attacking troops, transportation, light material, small boats, airplanes on the ground, tanks and antiaircraft artillery. It employs fast, maneuverable airplanes equipped with from 4 to 6 machine guns, which fire straight ahead and with pivoted rear guns. It carries from 250 to 400 lbs. of light bombs or tanks for spreading gas or laying smoke screens. It operates in large formations and flies close to the ground.

Pursuit is designed for destroying enemy aircraft. Its airplanes are the fastest and most maneuverable obtainable. It is armed with machine guns which fire straight ahead. Light bombs, gas and smoke tanks can also be carried for attack against ground objectives. It operates in large formations and at all altitudes.

The air force has its own observation aviation and an aerial combat train composed of airplane transports and AIRSHIPS. It is organized for administration and command into groups consisting of three or four squadrons containing from 12 to 25 airplanes each.

Air Force Base. The base comprises two landing fields per squadron, a comprehensive supply system embracing all army services and a communication net, both wire and radio. Transportation within the base requires rail, truck and air trains. Interplane and ground-to-plane radio is provided for command during missions. The air force is assembled, unit by unit, in the air on accurate time schedules for each mission. Alternate base facilities are provided to extend the sphere of influence of the air force; combat elements may operate from a new base 1,500 miles away within 48 hours.

Powers and Limitations of the Air Force. Compared with land and sea forces, the air force has powers and limitations peculiar to itself, which are derived from the medium in which it operates—the air. Terrain features and surface obstacles, including those imposed by the enemy, do not restrict its movements, nor are they available to an attacked air force as elements of defensive strength. The air force can not occupy a position in the air, but must accomplish its function through its power of destruction. It can remain in the air, and hence in action, but a short time, and once it has expended its bombs and ammunition it is useless until it has returned to its base. The area which the air force can cover in a single attack is restricted due to the limited amount of bombs it can carry. Its objectives must, therefore, be concentrated and highly important to warrant its use. Within its radius of action from its base all such objectives are open to attack at the will of the commander. While its base is protected, its targets are not restricted by the ground situation. Its powers lie in its flexibility, its versatility, and its freedom of action. It must be destroyed either on the ground or in the air to prevent its use. The weaker air force can not protect the area in which it is located, for, unlike surface forces which utilize terrain, the defending air force must be more powerful than the attacker. Power does not lie, however, in larger num-

bers. Numerical strength may be offset by superior performance of airplanes, greater skill of pilots, sounder tactics and more efficient ground organization. The powers and limitations of the air force differ so greatly from those of surface forces that it can not be considered as a replacement for any element of ground or sea tactical teams. It is an addition to war-making forces developed as a result of man's new ability to navigate the air.

Rôle of the Air Force. Against a determined or desperate nation, war can be brought to a conclusion only by ground forces. The operations of sea or air forces which do not have as a basis the creation of conditions which permit the ground force to accomplish its functions are inconclusive. This fundamental fact determines both the strategical and tactical employment of the air force. In accomplishing this mission it may operate with the fleet or in detailed combination of its elements with those of the ground force, or it may be employed in an area far removed from either.

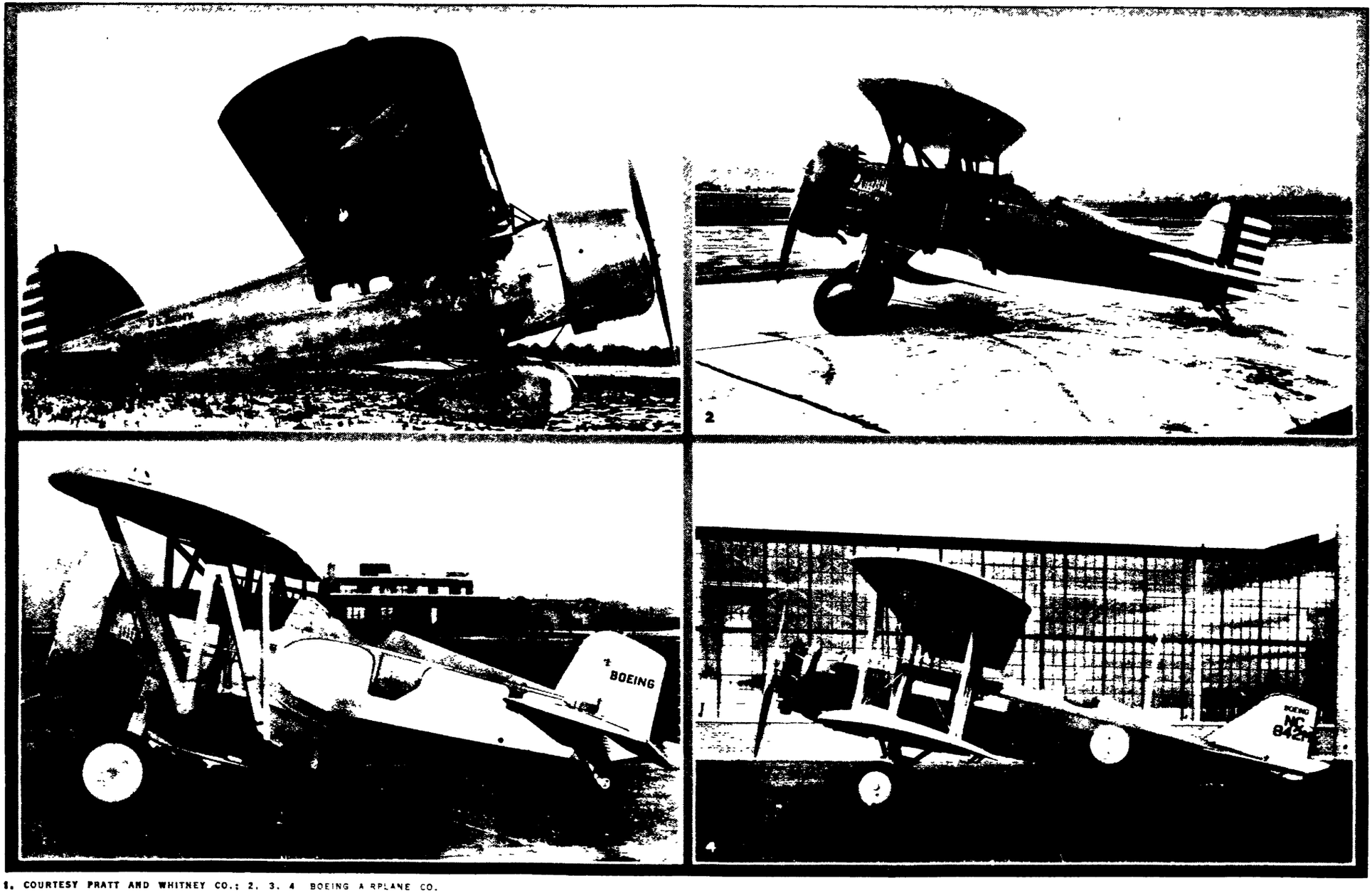
The expense of aviation and the necessity for maintaining the tactical team intact limit the air force initially available to each nation to one large unit. Strategical considerations will draw the air forces together at the critical area and the first mission both in point of time and importance for the stronger will be to eliminate the weaker. Combat to gain superiority can be forced by sustained attacks on the ground forces or on an industrial area, the activities of which are vital to the nation. After this phase, the air force is then used by the highest commander to reach far into the enemy area to force and maintain a condition therein favorable to the action of his ground forces. The enemy supply, transportation and communication system, both military and national, is disrupted. He is forced to scatter his troops over wide areas for protection and the use of roads is denied him in order to cut down his mobility and to induce fatigue and loss of morale. At the critical moment in operations and at the critical point the air force is thrown in as a powerful reserve force. It is the instrument used by the supreme commander to set the stage for the most effective employment of his ground forces. *See also* NAVAL AVIATION. H. M. Hi.

MILITARY BAND, a collection of wind and percussion instruments suitable for accompanying a marching regiment. It is usually identical with the brass band save for the inclusion of reed instruments. Its size naturally varies according to circumstance, but between 40 and 70 members are the conventional limits. A full-size military band has the following instruments: piccolos, flutes, oboes, clarinets, saxophones, bassoons, contrabassoon, cornets, trumpets, flugelhorns, horns, euphoniums, trombones, bombardons, drums, cymbals.

MILITARY ENGINEERS AND ENGINEERING. Military engineering in general is the adaptation to military purposes of sound engineering principles as established in civil practice. The principal difference between civil engineering and military engineering is that, in the latter, time is the essential element and economy is a secondary consideration. Military engineering work ranges from the hastily constructed temporary expedients, suitable for the extreme forward points of contact with the enemy, to the more formal and carefully planned works outside the theater of operations. In all its phases of construction it utilizes or adapts existing installations to military purposes wherever possible, resorting to entirely new construction only when such procedure is more rapid. Military engineering includes fortification, both field and permanent, including the selection of sites; design of works and construction thereof; operation of railroads in the theater of operation, including maintenance of existing lines and construction of new ones; map making and map reproduction; construction of roads, trails and highways and their maintenance; general construction in the theater of operations, including installation of such utilities as water supply, power and light and CAMOUFLAGE; and, generally, all works of maintenance, construction and installation wherein engineering technique is required.

T. H. E.

MILITARY GOVERNMENT, the dominion established over enemy territory and its inhabitants by a belligerent occupant. It is an exercise of the law of hostile occupation—a branch of the law of war, which in turn is a branch of the law of nations. The belligerent occupation which is a condition precedent to the establishment of military government connotes a successful invasion and the establishment of the invader's authority over the occupied territory and its population. Prof. Hyde defines belligerent occupation as "that stage of military operations which is instituted by an invading force in any part of an enemy's territory, when that force has overcome unsuccessful resistance and established its own military authority therein." The existing government having been overthrown by the successful invader, it becomes incumbent upon him to supply its place. The government established by the belligerent occupant is broader in scope and purpose than mere martial rule incident to the precedent stage of invasion. Military government has, broadly speaking, two purposes: one, to promote military operations and the prosecution of the war; and, the other, to insure the life of organized society in the territory. Hence control through military government takes the place of the former administration and extends to every function of government it may be necessary to invoke to effectuate the two general purposes just mentioned. However, military government being provisional only, the suspension of existing law and the promulgation of new laws should go no further than military necessity requires. Military government does not connote complete substitution of the will of a commander for preexisting law. It is a new instrument for the preservation of society, the maintenance of order and the protection of rights within the territory affected, in addition to being an instrument designed to aid the belligerent occupant in the prosecution of the war. E. A. K.



1, COURTESY PRATT AND WHITNEY CO.; 2, 3, 4 BOEING AIRPLANE CO.

PLANES IN GOVERNMENT AIR SERVICES

1. Wasp-powered all-metal Lockheed "Vega" plane. 2. United States army fighter.
3. Wasp-powered United States Navy fighting plane. Flotation bags keep the planes afloat if forced down at sea. 4. Four-passenger mail plane.

MILITARY INSIGNIA. *See* INSIGNIA, MILITARY AND NAVAL.

MILITARY JURISDICTION, authority exercised by a government in three ways—by the administration of that branch of its municipal law which provides for the establishment and control of its military forces; by controlling temporarily, through its military forces, under stress of necessity, the civil population of a district in the track of war or in a state of insurrection; and by occupying with its military forces and exercising through those forces the functions of government over enemy territory.

The jurisdiction exercised by the military authorities of the United States rests in part upon the Federal Constitution and Federal statutes, and in part upon accepted principles of international law. E. A. K.

BIBLIOGRAPHY.—*Manual for Courts-Martial,* U.S. Army; Winthrop's *Military Law and Precedents;* Davis, *Military Law of the United States.*

MILITARY LAW, the body of public law of a country which provides for the government of its military establishment. It is operative during both peace and war. The military law of the United States is to be found in the Constitution, the Articles of War enacted by Congress, other statutory enactments relating to the Army, Army Regulations, the Manual for Courts-Martial and various other War Department publications, general and special orders and decisions promulgated by the War Department and by military commanders, the customs of war and the customs of the service.

The persons subject to the military law of the United States are specified by Congress in the Articles of War and other enactments. They include officers, members of the Nurse Corps, warrant officers, and soldiers of the regular army; members of emergency components of the Army accepted, called, drafted or ordered to active duty, including the National Guard in Federal service; cadets; officers and soldiers of the Marine Corps detached for service with the Army; retainers to the camp and persons accompanying or serving with the Army beyond the territorial jurisdiction of the United States; in time of war such retainers and persons accompanying or serving with the Army in the field, both within and without the territorial jurisdiction of the United States; and persons under sentence adjudged by courts-martial. A person subject to military law charged with violations of that law may be tried by court-martial or dealt with by his commanding officer in the exercise of that officer's limited disciplinary powers.

Courts-martial are of three kinds, general, special and summary.

The jurisdiction of courts-martial is entirely disciplinary or punitive. None of them is vested with jurisdiction to hear and determine a civil cause of action.

The power to appoint a court-martial is an attribute of command. Accordingly commanding officers are clothed with authority to appoint such courts. The President as Commander-in-Chief, and officers exercising command over the larger and more important territorial or tactical subdivisions of the Army may appoint for their commands courts of each of the three grades, general, special, and summary. Those holding commands next in subordination may appoint special and summary courts. Officers holding the smaller commands may appoint summary courts only. A commander may not appoint a court for the trial of a case in which he is the prosecutor or a witness for the prosecution. In such circumstances the power of appointment passes to the next superior commander.

Courts-martial are composed entirely of commissioned officers: general courts-martial, of five or more, including a law member; special courts-martial, of three or more; and summary courts, of one. No officer is eligible to sit as a member of a general or special court-martial for the trial of a case in which he is the accuser or a witness for the prosecution.

General courts-martial have power to try any person subject to military law for any crime or offense made punishable by the military code. Neither the special nor the summary court has jurisdiction over capital offenses; and the punishing power of each is carefully limited. The jurisdiction of the summary court is the least extensive.

For each general or special court-martial the appointing authority is required to appoint a judge advocate to represent the government, and a defense counsel to represent the accused. The latter may, however, ask for some other officer to defend him or may employ private counsel.

Military judicial procedure is initiated by the filing of a written charge, verified by the accuser under oath, describing simply but specifically the offense alleged.

No charge may be referred for trial until after a thorough and impartial investigation designed to arrive at the truth of the matter and to afford a basis for a conclusion as to the disposition to be made of the case in the interest of justice and discipline. This investigation, at which the accused is entitled to be present and to be heard, is made by or under the direction of the commanding officer having immediate summary court-martial jurisdiction over the accused. That commander may dismiss the charge, may cause it to be dealt with under the limited disciplinary powers of commanding officers without referring it to a court, may refer it to a summary court or may forward the record to superior authority with a view to trial by special or general court-martial. Superior authority has the same choice of action. However, no charge may be referred to a general court-martial for trial until after the appointing authority has taken the advice of his law officer, his staff judge advocate, in the premises.

Trial procedure is quite similar to that of the civil courts. Members of a general or special court-martial may be challenged for cause by the government and by the accused. Each side is entitled to one peremptory challenge. The rules of evidence are those of the Federal courts, subject to certain specific rules pre-

scribed by the President under authority of Congress. Conviction of an offense for which the death penalty is mandatory requires a unanimous court. To adjudge a capital sentence also requires a unanimous court. Other convictions and sentences may be determined by a two-thirds vote of the members present, except that certain long-term sentences may only be adjudged upon concurrence of three-fourths of the members present.

In trials by general court-martial the record includes the evidence. The accused is entitled to a copy of the record. The records of trial by inferior courts are more summary.

Every record of trial undergoes an automatic appellate review by the convening authority, whose approval is necessary before any sentence may be executed; and before acting upon a record of trial by general court martial the convening authority is required to take the advice of his law officer.

Every record of trial by general court-martial undergoes a further automatic appellate review in the Office of the Judge Advocate General of the Army, who is clothed with authority to initiate appropriate action to correct legal error. *See also* JUDGE ADVOCATE GENERAL, U.S. ARMY. E. A. K.

BIBLIOGRAPHY.—*Constitution of the United States; National Defense Act; Articles of War;* U.S. Army, *Manual for Courts-Martial;* U.S. Army, *Opinions of the Judge Advocates General.*

MILITARY OCCUPATION, a term applied to the sovereignty exercised by a commander in enemy territory where he is in a condition to displace the authority of the former government and substitute his own. Inhabitants who remain may legally trade with the conquerors but not with their own people beyond the military lines.

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MILITARY POLICY, the attitude of the nation, as expressed in legislation, toward problems concerned with the creation, organization, mobilization, regulation, equipment and employment of armed forces. The military policy of the United States is established by Congress, but the executive branch of the government exercises no small influence, and most of the measures passed by Congress are originally proposed by the President or members of his cabinet.

When it was realized that the country would probably enter the World War, Congress enacted the National Defense Act of 1916. It provided for a regular army of 175,000, an officers' reserve corps, an enlisted reserve corps and the National Guard. Although this was a great improvement, it was inadequate, and the United States entered the World War with obsolete equipment, a deficiency of armament and with no trained reserve to expand the regular army.

However, the policy during the War was sound and effective. Congress, for the first time, placed the entire resources of the nation at the disposal of the President and military authorities and voted funds without hesitation. Other wise measures included the draft, a supreme commander of forces in the field from the beginning, enlistments for the war, expansion of the regular army, Federal appointment of officers, recalling of former officers to service, an effective organization of units, systematic mobilization of national resources and effective censorship of the press. Nevertheless, it was 14 months after the declaration of war before American troops under American officers engaged in battle, and most of their equipment had been purchased from the Allies.

Following the War Congress made a study of the American military policy and eliminated most of its weaknesses by the National Defense Act of June 4, 1920. This legislation provided for a regular army of 280,000 men and 17,000 officers, with provisions for war-time expansion; for a National Guard of 428,000 officers and men, largely under Federal control; and for a reserve of partially trained men, to include an officers' and enlisted reserve. The act organized the United States into three army areas and nine corps areas. It provided for duration-of-war enlistments; for industrial and military mobilization; for the preservation of the organization used in the World War; and for the establishment of Citizens Military Training Camps. *See also* NAVAL POLICY.

MILITARY SCHOOLS have had a place in the educational system of the United States for over 100 years, the first one on record being established in 1819 at Norwich, Vt., by Capt. Alden Partridge, formerly of the United States Military Academy at West Point. In 1862 the Morrill Land Grant Act provided for grants of public lands to those states which would include military training in their land grant colleges. In 1920 the Federal Government, by the National Defense Act, provided for the organization of units of the Reserve Officers' Training Corps in civil educational institutions asking for such units. Of the 50 accredited military schools or academies which are primarily private preparatory schools but include military training, less than a quarter were established after 1900. But the number of institutions which have added military training to their curriculum has increased very markedly since the World War. In 1912 there were approximately 60 giving such training; in 1927 there were 224, of which 125 were colleges and universities, and 54 high schools. In 86 of the universities and colleges, and 20 of the high schools this training was compulsory. In 1931 some of the colleges which had previously required military training started a movement to make it elective.

MILITIA, military forces composed of citizens who devote only part of their time to military pursuits. It generally includes all the forces of a nation other than those in the regular or professional establishment.

The United States constitutional policy regarding militia placed in the hands of the states the power of appointing officers for the militia and the authority for training. Congress reserved simply the right to prescribe discipline. Numerous vain attempts were made after the adoption of the Constitution to enact legislation permitting more Federal control and providing for more uniformity in the training, equipment

and discipline of the state forces. Not until 1903 was any effective law passed. The act of 1903 provided that for each Congressional representative a state might raise 100 men between the ages of 18 and 45. A period of five years was allotted states to enact laws making the discipline, organization and training of such forces raised the same as that in the regular army. Compliance entitled the state to a proportional share of a $1,000,000 appropriation. State forces raised in compliance with the new act were designated as the organized militia, all other state forces, or in effect all other male citizens between the ages of 18 and 45 were designated as the unorganized militia. The act of June 3, 1916, designated the organized militia as the NATIONAL GUARD and increased the strength of the forces which a state might raise to 200 for each member of Congress with a 50% annual increase until the number reached 800.

The most constructive legislation yet enacted was the National Defense Act of June 4, 1920, which provided for territorial organization as a basis for MOBILIZATION in war. Under it the National Guard with peace strength and organization specified by the President from time to time is the nucleus from which two field armies will be raised in time of war. Of the other armies of the initial six-army field force one will be formed by the regular army and three by the organized reserves. The bulk of the enlisted strength of the organized reserves will of course be drawn from the man power previously designated as the unorganized militia.

As constituting the organized militia of a state, the National Guard may be employed by the state as specified by the Constitution, or it may be employed by the Federal Government within the borders of the country to execute laws of the union, suppress insurrections and repel invasions. In time of war when authorized by Congress the President may draft the National Guard into the service of the United States for the period of the emergency, in which case the restrictions on its use as organized militia do not apply.

The militia of England whose development served as a foundation for the United States militia policy became a component of the Crown forces in 1871. It ceased to be called militia in 1908, but after the World War the name was revived, although it is practically nonexistent except on paper. The British second line of defense created to replace the militia in 1918 is known as the Territorial Army. It is similar to the United States organized reserves.

The Voluntary Militia for National Safety formed in Italy in Jan. 1923 is purely an instrument of the Fascist party. Its effective strength in 1931 was estimated at about 380,000, all of whom are drawn from the Fascist ranks. Part of the force was on an active duty status as port and railway police. The remainder was available in emergencies to maintain order. *See also* NAVAL RESERVE. E. D. P.

BIBLIOGRAPHY.—*National Defense Act 1916*, as amended to include Mar. 4, 1927; J. F. C. Fuller, *Imperial Defense;* G. Salvemini, *The Fascist Dictatorship in Italy.*

MILK, the whitish, opaque secretion of the mammary glands of animals, with which they normally nourish their young. Milk varies considerably in composition among different species and breeds of animals. Average cows' milk, the kind in principal commercial use, normally contains about 87% water, 4% fat, 5% LACTOSE, 3% CASEIN and ALBUMIN, and the remainder mineral. For centuries man has used the milk of cattle, sheep, goats, and other domestic animals as a food, including its use as a substitute for human milk in the nourishment of infants.

From milk are derived a large number of manufactured products used chiefly for food, as illustrated by BUTTER, CHEESE, and ICE CREAM, but also utilized in the arts and industries, as in the case of casein. For the guidance of officials in enforcing the Federal Food and Drugs Act, the U.S. Department of Agriculture has promulgated definitions and standards, of which the following deal with milk and its principal direct products.

Milk is the whole, fresh, clean lacteal secretion obtained by the complete milking of one or more healthy cows, properly fed and kept, excluding that obtained within 15 days before and 5 days after calving, or such longer period as may be necessary to render the milk practically colostrum free.

Pasteurized milk is milk that has been subjected to a temperature not lower than 145° F. for not less than 30 minutes, after which it is promptly cooled to 50° or lower. Homogenized milk is milk that has been mechanically treated in such a manner as to alter its physical properties, with particular reference to the condition and appearance of the fat globules.

Skimmed milk is milk from which substantially all the milk fat has been removed. BUTTERMILK is the product that remains when fat is removed from milk or cream, sweet or sour, in the process of churning. It contains not less than 8.5% of milk solids not fat. Cultured buttermilk is the product obtained by souring pasteurized skimmed or partially skimmed milk by means of a suitable culture of lactic bacteria. It contains not less than 8.5% of milk solids not fat.

Evaporated milk is the product resulting from the evaporation of a considerable portion of the water from milk, or from milk with adjustment, if necessary, of the ratio of fat to nonfat solids by the addition or by the abstraction of cream. It contains not less than 7.8% of milk fat, nor less than 25.5% of total milk solids; provided, however, that the sum of the percentages of milk fat and total milk solids be not less than 33.7%.

Sweetened condensed milk is the product resulting from the evaporation of a considerable portion of the water from milk to which sugar has been added. It contains not less than 28% of total milk solids, and not less than 8% of milk fat.

Dried milk is the product resulting from the removal of water from milk, and contains not less than 26% of milk fat, and not more than 5% of moisture.

Malted milk is the product made by combining

whole milk with the liquid separated from a mash of ground barley malt and wheat flour, with or without the addition of sodium chloride, sodium bicarbonate, and potassium bicarbonate, in such a manner as to secure the full enzymic action of the malt extract, and by removing water. The resulting product contains not less than 7.5% of butterfat and not more than 3.5% of moisture. J. R. M.

As a Food. Milk has been described as "an aqueous solution of milk sugar, albumin, and certain salts, holding in suspension globules of fat, and, in a state of semi-solution, casein together with mineral matter." The relative amounts of the different constituents vary with the breed and individual characteristics of the cow, the season of the year, the stage of lactation, feeding and care, time and completeness of milking. Market milk is almost always the mixed product of many cows, so that such differences are more or less obscured. A frequently quoted estimate of the approximate composition of average cow's milk gives the total protein as 3.3%, fat 4%, and milk sugar (lactose) 5%. The energy value of a quart of such milk is 675 calories, of which 18.9% are calories of protein, or, to put it differently, there are approximately 1¼ oz. of protein in each quart. This means that milk is a protein-rich food. The chief proteins of milk are lactalbumin and casein, the latter being the protein which forms curds with rennin or acid. These proteins are of high nutritive value because they contain all of the essential amino-acids for body building and repair, and they not only can serve as the entire protein supply in a diet, but they make an effective supplement to the proteins of other foods, such as cereals, since milk proteins are rich in the amino-acids in which the grains are poor.

The carbohydrate in milk, lactose, is less likely to ferment than other sugars, and less liable to irritate the membranes lining the digestive tract. It has another distinct advantage in that it favors the development of the *Bacillus acidophilus* in the intestine, checking intestinal putrefaction.

Milk fat is already emulsified, and thus more readily digested than the fats of most other foods except eggs. Milk contains various minerals needed by the body. It is the richest and cheapest source of calcium. One quart a day will furnish all the calcium needed by a rapidly growing child. It is usually the chief source of calcium in any diet, and when the amount of milk used is small, the diet is almost sure to be deficient in calcium. It is a rich and fairly economical source of phosphorus. It contains relatively little iron, but what is present is in a form which is particularly well utilized by the body. Milk is rich in vitamins A, B and G. It supplies some vitamin E and a little D. The quantity of vitamin C present varies with the diet of the cow and the age and condition of the milk. It is somewhat reduced by pasteurization, boiling, canning and drying. Milk is quite completely and easily digested. H. T. B.

Condensed Milk is concentrated milk containing added Sucrose (cane or beet sugar) in an amount nearly sufficient to saturate the water remaining in the product, thus preventing spoilage by bacteria. Condensed whole milk contains approximately 8% fat, 29% total milk solids, 44% sucrose and 27% water. The milk constituents are present in a little over twice the amount found in normal milk. Condensed skim-milk contains approximately 24% milk solids, 46% sucrose, and 30% water. Very little condensed skim-milk is canned.

Several special types of condensed milk products are made. Plain condensed milk contains no added sucrose, but it is kept cold after manufacture and must be utilized within a few days. Condensed ice cream mix is made by mixing the constituents and condensing to remove the desired amount of water. Condensed sour skim-milk is concentrated about 4 to 1 and is used in chicken feeding. The acidity, as increased by condensing, is high enough to preserve it.

In making sweetened condensed whole milk, the milk is heated in a large vat for a sufficient time to effect proper pasteurization after which a proper amount of sucrose is added. As soon as the sugar is dissolved, the mixture is drawn into a vacuum evaporator and water is removed until the desired concentration is reached. Evaporation under vacuum is essential to retain the natural flavor and condition of the whole milk. The condensed milk is immediately removed from the evaporator and cooled and later canned or barrelled.

New York State leads in the production of condensed milk, followed by Wisconsin, Illinois, and Michigan in the order named. The production in 1929 was as follows: canned skimmed milk, 1,632,000 lbs.; canned whole milk, 145,922,000 lbs.; bulk skimmed milk, 202,475,000 lbs.; and bulk whole milk 51,689,000 lbs.

The canned milk is utilized mainly for household purposes. The bulk condensed milk is utilized as an ingredient in other products, such as ice cream, chocolate, and baked goods.

Dried Milk, or milk powder, the product remaining after practically all of the water has been removed from milk. Dried milk is restored to its original composition upon the addition of water.

The most important methods of removing the water in the preparation of this product may be grouped under the general headings of spray and drum drying. In spray drying, the milk, with or without previous condensing, is sprayed or "atomized" into a current of hot air entering a drying chamber. The water rapidly evaporates and the milk solids fall to the bottom of the drying chamber in the form of microscopic spheres. Drum dryers are of the atmospheric or vacuum types. In the atmospheric drum dryer the milk is applied to the outside of an internally steam heated revolving metal drum. During its rotation part of the drum passes through the milk, picking up a thin coating which dries as the drum revolves. This coating, which is about .001 in. thick, is then scraped off by a knife held in contact with the drum. In the

vacuum drum dryer the steam heated cylinder is rotated in a vacuum chamber to alleviate the effect of the high temperature.

The states of Wisconsin, California, and New York lead in the production of dried milk. In this country there was produced, in 1929, 54,215,000 lbs. of dried buttermilk, 13,202,000 lbs. of dried whole milk, 207,579,000 lbs. of dried skim-milk and 294,000 lbs. of dried cream.

Dried whole milk and dried part skimmed milk are used largely in infant feeding. When used for that purpose, dried milk has an advantage over ordinary milk in that the fat globules are broken up by homogenization, causing the curd formed to be soft. Dried whole milk is also used as a constituent of proprietary infant foods. Dried skimmed milk is used extensively in the manufacture of bread and ice cream and in animal and poultry feeding.

Evaporated Milk is concentrated milk in which the growth of bacteria and subsequent spoilage is prevented by heat sterilization in hermetically sealed cans. It does not contain added sugar. Evaporated whole milk contains 7.8% milk fat, and 33.7% total milk solids. Evaporated milk can be restored to approximately its concentration before evaporating by the addition of an equal volume of water. The production of sterilized cream is in the process of development.

In making evaporated milk, the milk fat and milk solids not fat are first brought to the proper ratio and heated in a vat to near the boiling point; the hot milk is then drawn into a vacuum evaporator and water is removed until the desired concentration of the milk constituents is reached. Evaporation under the vacuum occurs at a temperature below 140° F., and is desirable because it aids in reducing browning and cooked flavor. After evaporation the milk is homogenized, to reduce the size of the fat globules, and canned. The cans are hermetically sealed and any bacteria still in the product are destroyed by heating in a steam heated pressure sterilizer.

Wisconsin leads in the production of canned evaporated milk and is followed by California, Illinois, Ohio, Michigan and New York in the order named. In 1929 there was produced in the United States 1,499,644,000 lbs. of canned evaporated milk.

About one-fourth of the canned foods consumed in the United States consists of evaporated milk. This product is used like ordinary market milk, not only in cooking but often as a table milk and cream. It is very useful under conditions where a reliable milk supply is not available or convenient. It is finding increasing use in infant and invalid feeding and has the advantage that the fat globules are very small and the curd, which is formed in the stomach, is soft and fine. P. F. S.

Inspection of Milk. Most states and large cities have systems of milk inspection. Formerly designed to prevent adulteration this now acts more as a safeguard against the spread of disease. Ideally such inspection should cover herds, stables, creameries—everything that affects the production and handling of milk, as well as its actual quality. The New York State law, which is typical, provides for the taking of samples of milk at the point of production, shipping station and places of sale. It sets a minimum standard of butterfat content and a minimum percentage of solids. It forbids the sale of milk from cows within 15 days before and five days after calving; of milk from cows kept in crowded or unhealthy conditions, or unhealthily fed; of skimmed or partly skimmed milk; of adulterated milk or cream. Almost all states have similar provisions, and forbid the use of preservatives, such as borax, salicylic acid or formaldehyde. In most states two grades of milk are recognized: Grade "A," which must not contain over 30,000 bacteria to the cubic centimeter, and Grade "B," which must be pasteurized and not have over 50,000 bacteria to the cubic centimeter. From 3.0 to 3.25% of fat and from 11.5 to 12% solid content are typical minimum requirements. X.

Malted Milk is made by first warming a mash of wheat flour and barley malt, so that the Enzymes of the malt convert the starch to sugars. The liquid portion of the digested mash is then separated and mixed with about 45% of its volume of whole milk. This mixture is usually dried in a special vacuum evaporator equipped with a powerful stirrer.

Malted milk should contain not less than 7.5% milk fat, about 14% protein, and about 70% carbohydrates. It should not contain over 3.5% of moisture. Each pound of malted milk should contain the solids from 2.2 lbs. of whole milk. The production of malted milk in the United States for the year 1929 was 22,850,000 lbs., most of which was produced in Wisconsin and Illinois.

The nutritive value, digestibility, keeping quality and convenience of malted milk has led to its wide use in the feeding of infants and invalids. Because of its pleasing flavor it is used at soda fountains, by confectioners and in the home. P. F. S.

Marketing Milk. So rapidly has milk distribution been improved throughout the United States that milk drawn early in the day in Northern New Hampshire is shipped that morning, pasteurized in Boston that evening, and reaches customers the next morning. This also applies to northern New York and New York City, western Pennsylvania and Philadelphia, and other large cities. Special milk trains often make faster running time than passenger expresses, milk being kept iced in transit to prevent bacterial development. Better cooperation between the great milk supply companies and milk shed farmers has also speeded handling. As farmers' cooperative associations have secured better prices, more farmers have gone into dairying, while cooperative marketing, breeders' groups, cow testing associations, etc., have raised production and lowered cost.

Pasteurization of Milk. When first drawn, milk has a sweetish taste and faint alkaline reaction. Almost immediately, fermentation due to the presence of bacteria starts, and unless halted, soon renders the milk unfit for human consumption. In addition, disease

germs may sometimes get into the milk, the most dangerous being tuberculosis and typhoid fever. Since supplies must often travel long distances, safe methods of checking the growth of both classes of bacteria became imperative. If milk be cooled to 40° F immediately after drawing and kept near that temperature, little fermentation occurs, but this is economically impracticable. The process called pasteurization, developed by Louis PASTEUR to control wine fermentations, has proved most satisfactory. Milk is ordinarily considered safe if pasteurization destroys the tuberculosis bacillus. This requires a temperature of 142° F. for 30 minutes, 155° F. for 15 minutes, or 167° F. for 10 minutes—now standard pasteurizing temperatures. Immediately after being pasteurized the milk must be cooled rapidly to 50° F. or below. Pasteurization has so reduced the spread of tuberculosis and typhoid fever through milk that most large cities require it, except in the case of milk of superior sanitary quality, "Grade A" or "Certified" milk. *See also* TUBERCULOSIS. X.

Products of Milk. About half of the milk produced in the United States is consumed as such, the remainder, about 60 billion pounds, is utilized in the manufacture of milk products.

Many of these products have as one of their functions the preservation of the milk or milk constituents and the reduction of bulk for more economical storage and transportation. Whole milk is concentrated to condensed and dried milk. The proteins and fat of milk are concentrated and preserved in the various forms of cheese, while the fat, milk's most valuable constituent, may be preserved as butter, butter oil, and frozen cream.

Whole milk is utilized in baked goods, as a constituent of malted milk, milk chocolate, ice cream, and several proprietary infant and invalid foods. Whole milk is used in making cheese, which consists mainly of fat and casein, the whey containing most of the milk sugar being removed.

A number of cultured sour milks are made. The milk is first pasteurized to destroy any undesirable bacteria which may be in the milk. After the milk is cooled, cultures of specific bacteria are added to sour the milk. In this way cultured buttermilk, Bulgaricus buttermilk and Acidophilus milk are made. The soured milk is sometimes dried.

Chocolate milk is made by adding chocolate or cocoa to milk. It may be bottled and sterilized. Dried milk containing cocoa is also manufactured.

As a result of passing milk through a centrifugal separator, cream and skim-milk are obtained. Commercial cream for shipment usually contains from 40 to 60% of fat. For household use, cream is usually standardized to a lower fat content. Fresh cream may be used for household purposes, as a constituent of confectionery, baked products, ice cream, or it may be frozen and held in cold storage. The largest amount of cream is used in the manufacture of butter. The butter may be made from either fresh cream or ripened cream. Ripened cream refers to cream which has been soured by special types of bacteria which give the resulting butter desirable flavors. Buttermilk is obtained as a by-product. The buttermilk may be returned to the dairymen for stock feeding, or it may be dried or soured and condensed for stock feeding. Condensed sour buttermilk or condensed sour skim-milk has been found to be very desirable in chicken feeding, since it aids greatly in controlling certain types of intestinal diseases of chickens. Cream is used in making certain types of soft cheese such as cream cheese, and in certain of the larger cities there is a considerable market for sour cream to be used as a spread. Butter and frozen cream are used in ice cream making and frozen cream is used in making cream cheese.

A large number of products are made from skim-milk. When condensed with or without sugar it is used in the manufacture of ice cream and in baking. Dried skim-milk finds the same uses, and in addition is used in stock feeding and as a constituent of some proprietary foods for infants and invalids. A considerable amount of skim-milk is used in the manufacture of casein. Casein is used for paper coating, gluing, as a binder in cold water paints, and in making casein plastics.

Whey is the liquid remaining after the removal of fat and casein from the milk. Large amounts are formed as a by-product from the manufacture of cheese and casein. Whey contains about 4.8% milk sugar, 0.8% protein and 0.5% ash. Whey is dried for animal feeding; sometimes other materials are added to aid in drying. Whey is also utilized in the manufacture of milk sugar or lactose. Milk sugar is used in infant feeding and in proprietary foods. It is used as a drug diluent or carrier and in pill making and coating. Milk sugar has a special effect in controlling the intestinal bacteria tending to prevent putrefaction in the intestine. P. F. S.

Production of Milk. The production and consumption of milk in the United States has increased enormously. In 1920, the total production approximated 89,657,000,000 lbs., about 47% being used for butter, cheese, and condensed, evaporated and powdered milk. In the same year, the United States exported 414,250,021 lbs. of condensed, evaporated and powdered milk, importing over 23,000,000 lbs. of these products and nearly 16,000,000 lbs. of cheese. In 1930, only 96,682,467 lbs. of condensed, evaporated and powdered milk were exported, and about 7,000,000 lbs. imported, but 68,310,716 lbs. of cheese came into the country. Inasmuch as a pound of cheese equals 10 lbs. of milk, the consumption of milk and milk products is obviously constantly increasing, for the total production in 1930 was estimated at 122,000,000,000 lbs.

In terms of whole milk, the 1920 per capita consumption slightly exceeded 400 lbs.; that of 1930, about 1000 lbs. This increase is due largely to a wider knowledge of the extremely important food value of milk. Prohibition has greatly increased ice cream consumption, while brand naming of cheese and butter

has stimulated their sale. *See also* FOOD FOR THE INDIVIDUAL.

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MILK FEVER, a disease caused by a poison which forms in the udder of some cows after calving. This poison is absorbed and enters the circulation, affecting the whole body, especially the nervous system. The symptoms begin about 48 hours after the birth and are those of a general paralysis. Secretion of milk usually fails and there are acute digestive disturbances. Treatment consists in injecting the teats with a solution of chinosol and insufflating the udder with air or oxygen.

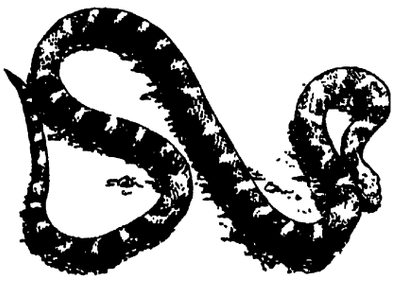
MILKING MACHINE. The first patent granted in the United States for a milking machine was in 1849, but it has been only recently that the machine has become practical. The modern milking machine compares favorably with hand milking, both in germ content and in the effect upon the milk flow.

The machines on the market can be divided into two general classes: those that apply an intermittent vacuum to the teat, and those that apply a constant vacuum to the teat and an intermittent atmospheric pressure on the outside of a pliable rubber teat casing. J. T. B.

"MILK-LEG." *See* VARICOSE VEINS.

MILK-PEA, the general name for a numerous genus (*Galactea*) of the pea family comprising 70 species native chiefly to tropical and subtropical regions. A milky juice (latex), rare in plants of this family, is found in some species. Most species are prostrate or climbing perennial vines, though some are erect and shrubby. They bear leaves of three leaflets and purple or violet flowers in axillary clusters. About 25 species occur in the southern and southwestern states, of which the downy milk-pea (*G. volubilis*) and the smooth milk-pea (*G. regularis*) range northward to New York and Kansas.

MILK SNAKE, called also house snake (*Lampropeltis triangulum*), a common constricting snake of the eastern United States. It is widely believed that this useful reptile milks cows but needless to say it



MILK SNAKE

has no such habit. Its presence in stables, barns and dairies is only evidence of a fondness for rats and mice. It may be recognized by its pattern of 28 to 62 black-edged, brown, gray or red dorsal blotches on a yellowish or grayish ground color. Its maximum length is 3½ ft.

MILK SUGAR. *See* LACTOSE.

MILK-TREE (*Sapium Hippomane*), a tree of the spurge family yielding a milky poisonous juice, found in tropical America from the West Indies to Brazil. It bears oblong leathery leaves somewhat resembling those of the willow or laurel, and small greenish flowers in terminal clusters. The cow-tree (*Brosimum Galactodendron*) is also called milk-tree.

MILKVETCH, a name given in English speaking countries to various herbaceous species of ASTRAGALUS, an immense genus of the pea family.

MILKWEED, a large genus (*Asclepias*) of perennial herbs usually with a profuse milky juice (latex), whence the name. There are fully 150 species mostly native to Africa and to North and South America. About 60 are found in the United States, distributed in all parts of the country. They are mostly rather coarse vigorous plants rising from thick deep-seated roots. The usually erect stems bear mostly opposite or whorled leaves, numerous flowers in showy umbels and large pods (follicles) in pairs containing many seeds tufted with long silky hairs. A few species are grown for ornament or possess medicinal properties, as the blood-flower (*A. curassavica*) and the butterflyweed (*A. tuberosa*). Several western milkweeds, notably the whorled milkweed (*A. galioides*), are exceedingly poisonous to livestock, especially sheep.

MILKWEED BUTTERFLY. The MONARCH BUTTERFLY is often called the milkweed butterfly, because its larvæ feed on different species of this plant. They are yellowish green caterpillars, broadly banded with black.

MILKWORT, the general name for a large genus (*Polygala*) of herbs, shrubs and small trees of the milkwort family. There are upwards of 500 species found very widely throughout the world except in the arctic zone, New Zealand and Polynesia, some 50 of which occur in the United States. They bear simple leaves, irregular flowers, solitary or in clusters, and small two-seeded pods. Among the best known North American species are the fringed polygala or flowering wintergreen (*P. paucifolia*), with handsome rose-purple flowers, and the Seneca snakeroot (*P. Senega*), with small white flowers, valued for its medicinal properties. Several shrubby species, as *P. myrtifolia* of South Africa with conspicuous purple flowers, are grown for ornament.

MILKY WAY, a luminous band of hazy appearance encircling the sky, actually consisting of large numbers of stars too faint to be seen by the naked eye individually, but whose light combines into cloud-like patches of brilliance. It is now recognized that this appearance is due to the fact that the stellar system to which the sun belongs is of a flattened, disk-like shape. Since the sun and the planetary system are situated inside this disk, the number of stars seen in the direction of the periphery of the disk is far greater than that seen in the direction perpendicular to the disk. In the former case we look through a far greater depth, hence the effect produced is that of an ill-defined band of light stretching clear across the

heavens. For this reason the whole stellar system just mentioned is called the Milky Way System or Galaxy. It is at least 300,000 light years in diameter, with the sun placed some 25,000 light years off-center.

The center is probably situated in the direction of the constellation SAGITTARIUS. There are great masses of obscuring material in this direction, which are apparent even to the naked eye through the rift they cause in the Milky Way from CYGNUS and AQUILA to Sagittarius. Immediately adjoining this rift are the most luminous portions of the Milky Way, the great star clouds of Sagittarius containing probably no less than several hundred million stars. The thickness of the disk of the Galaxy is very little compared to its diameter, probably not much more than some 30,000 light years. W. J. L.

MILL, JOHN STUART (1806-73), English author, philosopher and economist, eldest son of James Mill, utilitarian philosopher, was born in London, May 20, 1806. A very precocious child, he was educated entirely by his father under a system of training intended to speed his intellectual development. At three he was studying Greek and before he was ten he had read many of the important Greek authors and much English history, had been studying Latin and mathematics several years and was teaching the younger children of the family. In his middle 'teens he studied in France for a year and at 17 was appointed to a clerkship under his father in India House. Here Mill steadily advanced, becoming chief of his department, and remained with the company until its dissolution in 1858. He was a leader in the large group of philosophical radicals active in current life and thought, and wrote constantly in newspapers and magazines. Among his many books are *A System of Logic, Principles of Political Economy, On Liberty, Representative Government, Utilitarianism* and his *Autobiography*. He sat in Parliament 1865-68, worked for woman suffrage and during the American Civil War supported the North. Mill's pen always championed advanced liberal ideas and movements, and he exerted a stimulating influence on the younger intellectual life of the time. He died at Avignon, France, May 8, 1873.

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MILL, in ORE TREATMENT, a concentrating plant to separate the valuable mineral from the waste rock and GANGUE occurring with it in ore. The MINE RUN ore starts at one end of the mill and passes continuously through the crushing, grinding and concentrating stages. The CONCENTRATE thus obtained is sent to a smelter. Amalgamation and cyanide plants are sometimes also called mills. *See* ORE TREATMENT; MILLING.

MILLAIS, SIR JOHN EVERETT (1829-96), English genre, landscape and portrait painter, was born at Southampton, June 8, 1829, of an old Norman family. In 1847 he became the leader of the PRE-RAPHAELITE MOVEMENT. His early pictures, *Isabella, The Huguenot* and *Ophelia,* were favorably received, but *The Carpenter's Shop,* a realistic representation of the boy Christ exhibited in 1850, was attacked by all critics except Ruskin. Mrs. Ruskin, whom Millais later married, posed for the *Order of the Release,* 1853. The *Yeoman of the Guard,* 1877, in the Tate Gallery, London, and the portrait of a fair-haired child, entitled *Souvenir of Velasquez,* are among the best works of Millais' mature period when freedom of brush work and bold technique replaced the earlier tightness and detail. Millais died in London, Aug. 13, 1896.

MILLAY, EDNA ST. VINCENT (1892-), American poet, was born Feb. 22, 1892, at Rockland, Me. She was graduated from Vassar College in 1917, and in the same year made her début as a poet with *Renascence. A Few Figs from Thistles, Second April* and *Three Plays* soon followed and in 1923 *The Harp-Weaver* won the Pulitzer Prize. Commissioned in 1925 to prepare the libretto of an opera to be composed by DEEMS TAYLOR she wrote *The King's Henchman,* a lyric drama of Saxon England which won immediate success. In 1928 appeared *The Buck in the Snow,* a collection of lyrics, and in 1931, *Fatal Interview,* a sonnet sequence.

MILLBURY, a town and village in Worcester Co., southern Massachusetts. The village is situated on the Blackstone River, 6 mi. southeast of Worcester and is served by two railroads. Millbury is a manufacturing community making principally textiles, thread, felt goods, chains and edge tools, steel castings and high carbon wire. The town has fruit, truck, dairy and poultry farms. It was separated from Sutton and incorporated in 1813. Pop. 1920, 5,653; 1930, 6,957.

MILLEDGEVILLE, a city and the county seat of Baldwin Co., situated in central Georgia about 32 mi. northeast of Macon. The Georgia and the Central of Georgia railroads serve the city. The city lies in a fertile agricultural region. Milledgeville was founded in 1803 and received a charter in 1836. For many years, from 1804 to 1868, it was the capital of the state. When Brig.-Gen. William T. Sherman entered the city, Gov. Joseph E. Brown secured the aid of convicts, with the reward of pardons, in saving the state documents from falling into the hands of the enemy. The Georgia State College for women, the state hospitals for the insane and the state penitentiary and reformatory are located here. Pop. 1920, 4,619; 1930, 5,534.

MILLE LACS, a lake about 16 mi. in diameter situated a little east of the center of Minnesota. It lies in the northern part of Mille Lacs Co. and the southwestern part of Aitkin Co. It is a popular and attractive year-round resort, with fine hunting, fishing and other sports.

MILLENNIUM, as understood by the Christian churches, the period of 1,000 years which, according to the Book of Revelation (Chapter 20), will follow the victory of Christ over Satan and precede the last judgment. It is described as a period when Christ

will reign on the earth, with his saints and martyrs reigning as kings and priests. The millennium formed an important part of the belief of early Christians and continued as a vital doctrine for centuries. The year 1000 was entered upon with varied expectations as the result of the belief. The Reformation led some to expect it at that time. Some of Cromwell's followers thought it was inaugurated with the overthrow of Charles I, and 1666 was proclaimed to be the year of the second advent. Swedenborg held that it began in 1757. Bengel said it would begin in 1836, Miller in 1843, Channing in 1867, Baxter in 1881, and since that date many others have been announced. The entire notion of 1,000 years seems to have been derived from the Slavonic Book of Enoch (1-50 A.D.), which held that the world was created in six days, would exist for 6,000 years, and be followed by 1,000 years of rest or Sabbath.

MILLER, CHARLES RANSOM (1849-1922), American newspaper editor, was born at Hanover, N.H., Jan. 17, 1849. After graduating at Dartmouth College in 1872, he joined the staff of the New York *Times,* of which he became editorial writer in 1881 and editor in chief in 1883. During his 40 years of editorship he maintained the *Times* at a high level editorially and won world-wide recognition as a newspaper publisher. In 1913 he lectured at the Columbia School of Journalism. Miller died in New York City, July 18, 1922.

MILLER, DAYTON CLARENCE (1866-), American physicist, was born at Strongsville, Ohio, Mar. 13, 1866. He was educated at Baldwin University and Princeton, from which he received his doctor's degree in 1890. In 1888-89 he was professor of natural science at Baldwin University, joining the staff of the Case School of Applied Science at Cleveland, Ohio, in 1893, as professor in physics. He was associated there with A. A. MICHELSON in the latter's experiments on the ether drift and later continued and repeated these alone, announcing in 1924 his discovery of evidence of the existence of absolute motion in the ether, thus denying the theory of RELATIVITY. The results of his experiments were not universally accepted. He was awarded the annual prize of the American Association for the Advancement of Science in 1925.

MILLER, JOAQUIN (1841-1913), American poet whose real name was Cincinnatus Heine Miller, was born in the Wabash district of Indiana, Nov. 10, 1841. He tried his hand at mining, driving a pony express and at newspaper work in the Far West, and in 1866 he became judge of Grant Co., Ore. In 1870 Miller went to England, where he became a literary success, publishing there his first collection of poems, Songs of the Sierras. In 1873 *Songs of the Sunlands* appeared, and in 1882 his *Collected Poems.* The poet settled eventually in a home he built near Oakland, Cal., in the mountains overlooking San Francisco Bay, and died there, Feb. 17, 1913.

MILLER, KENNETH HAYES (1876-), American painter and etcher, was born at Oneida, N.Y., Mar. 11, 1876. He studied at the Art Students' League, New York, and became an instructor there. He has etchings and print collections in the Metropolitan Museum and Public Library, New York. Miller's paintings include *Interior* and *Woman in a Sculpture Gallery,* in the Los Angeles Museum; portrait of Albert P. Ryder, *Apparition, Consulting the Cards* and *White Kimono,* Phillips Memorial Gallery, Washington.

MILLERAND, ALEXANDRE (1859-), French statesman and President, was born in Paris, Feb. 10, 1859. He was educated for the law, and elected to the Chamber of Deputies (1885). At first a member of the Socialist group he gradually went over to the Nationalists and as a leader with Poincaré of that bloc had a powerful influence on the policies of France. He held many offices in the French republic and, on the resignation of Deschanel in 1920, succeeded to the presidency. While in office he showed such independence and self-will, that he was the object of the most bitter attacks which finally forced him to resign in 1924, despite the fact that under the constitution he still had three years to serve as president. As in the case of MACMAHON in 1879 the supremacy of the legislature over the executive was maintained. After 1925 he was a member of the senate.

MILLER'S THUMB, the common name for several small fresh-water fishes of the sculpin family (*Cottidae*). They have a smooth elongated body, which tapers backward from the broad head, and large pectoral fins. The common miller's thumb (*Cottus ictalops*), about 6 in. long, olive-colored with darker marking, occurs abundantly in clear streams and lakes from New York to North Dakota and southward to Virginia and Nebraska.

MILLET, FRANCIS DAVIS (1846-1912), American painter, was born at Mattapoisett, Mass., Nov. 3, 1846. He studied at the Royal Academy of Arts, Antwerp, and specialized in genre and mural paintings. He became a National Academician in 1885. His painting *At the Inn* was exhibited at the Centennial Exhibition of the National Academy of Design in 1925. *A Cosy Corner* and *An Old Time Melody* hang in the Metropolitan Museum, New York. Millet died in the *Titanic* disaster, Apr. 15, 1912.

MILLET, JEAN FRANÇOIS or **FRANCISQUE** (c. 1642-79), landscape painter, was born at Antwerp, probably in 1642, of a French father. He was apprenticed to a painter named Laurent with whom he went to Paris. Here he imitated Poussin in the production of landscapes in the classic style. His work is glowing in tone and graceful in conception. Millet died in Paris in 1679.

MILLET, a name somewhat loosely applied to various small-seeded cereal and forage grasses. The common millet (*Panicum miliaceum*), a smooth annual probably native to the East Indies, bears a white globular grain 1/16 in. or more in diameter. Since prehistoric times this millet has been grown for human food and for forage in India and southern Eu-

rope. The Swiss Lake dwellers and other peoples of the Stone Age made extensive use of its nutritious seeds. In the United States it is sparingly grown as a forage plant and for its seeds used as a food for poultry and cage birds.

The foxtail millet (*Setaria italica*), a strong-growing annual, bearing a smaller, variously colored nutritious grain, has been cultivated in various forms since remote antiquity. This millet was one of the five economic plants which the Chinese emperor Chin-nong in 2700 B.C. commanded to be sown each year in a public ceremony. It is a cultigen derived perhaps from the green foxtail (*S. viridis*), now a widely diffused weed. Foxtail millets are grown in the United States chiefly for hay and forage, especially the German millet (var. *stramineofructa*), the Siberian and Turkestan millets (forms of the var. *rubrofructa*) and the HUNGARIAN GRASS (var. *nigrofructa*). *See also* PEARL MILLET.

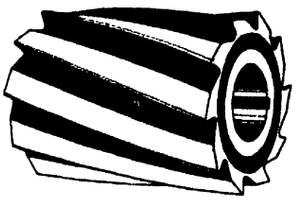
MILLIKAN, ROBERT ANDREWS (1868-), American physicist, was born at Morrison, Ill., Mar. 22, 1868. Graduating at Oberlin College, he received his doctorate from Columbia University in 1895, later studying at Berlin and Göttingen universities. He became assistant professor in physics at the University of Chicago in 1896, and professor in 1910. In 1921 he was called to Pasadena as director of the Norman Bridge Laboratory of the California Institute of Technology. He has been widely known for his measurements of the electron, its electric charge and mass, and for his work on the photoelectric effect, involving a determination of light quanta, and his proof of the existence of radiation with wave-lengths intermediate between those of visible light and X-rays. He has also concerned himself with analysis of the so-called cosmic rays, which he proved to originate outside the earth; he made accurate measurements of the wave-length of this ray. Among the many scientific honors and distinctions he received are the Faraday Medal and the Nobel Prize in physics, the latter awarded him in 1923. He has been chairman of the executive council of the California Institute of Technology since 1921.

MILLILITER, a unit of capacity in the METRIC SYSTEM, comprising the one-thousandth part of a LITER or one cubic centimeter; it is equivalent to 0.061 cubic inch.

MILLING, in ORE TREATMENT, an intermediate step between mining and the final metallurgical treatment. Usually, the ores mined are low grade and require concentration to separate the valuable minerals from the GANGUE. The object of milling is, therefore, to put the metallic constituents of the ore into a small bulk of high grade material, effecting a saving in freight and smelting expenses.

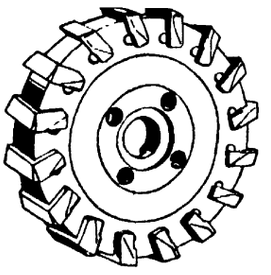
The two most important milling methods are GRAVITY CONCENTRATION and the FLOTATION PROCESS. Magnetic and electrostatic methods are used in special cases. Milling operations produce a CONCENTRATE, which comprises the valuable minerals, and a TAILING, which is discarded. *See also* ORE TREATMENT; MILL.

MILLING, FREE, a term applied to gold ores in which the native metal occurs, and from which a large proportion of the gold can be recovered by AMALGAMATION. Most oxidized or weathered gold ores are free milling; ORE in which the gold is intimately associated with iron pyrites, or in which it is very finely disseminated, is not free milling and has to be treated by the CYANIDE PROCESS. *See also* ORE TREATMENT; METALS, NATIVE; ORE DEPOSITS.



HEAVY DUTY PLAIN MILLING CUTTER

MILLING CUTTERS, rotary cutters used in MILLING MACHINES to remove metal. There are many sizes using either solid or inserted teeth. In modern practice the inserted cutters have tips of cemented tungsten carbide brazed in place on the cutting edge. This new cutting alloy usually not only permits higher speed than with steel cutters but due to its extreme hardness makes it unnecessary to remove and grind the cutters as frequently. It thus eliminates much idle time of the milling machine. While the use of the new cutting alloys is growing, there are still many applications for the older cutting steels.



COURTESY PRATT & WHITNEY CO.

MILLING CUTTER WITH INSERTED TEETH

MILLING MACHINES, a class of rotary-cutting MACHINE TOOLS for surfacing metal. The milling machine was the first rival of the PLANER and SHAPER, both of which use single pointed tools with a reciprocating motion. The rotary cutters permit the continuous removal of metal over a considerable area as the cutter passes along the work. By using cutters having special shapes and contours it is possible to machine several surfaces at once. There are several types of milling machines with both horizontal and vertical spindles, and with combinations of both, while spindles can also be set at an angle and many cutters can be operating on the work at the same time. Milling machines are made with both hand and power feed, and some are automatic, once the work has been fastened to the table.

MILLIPEDE, the popular name for members of an arthropod class (*Diplopoda*) found in all parts of the world. Many species live in the United States. Their bodies, which may be long, thin and rather worm-like, or short, fat and beetle-shaped, are divided into rings or segments, most of which bear two pairs of legs. Some millipedes have only 14 segments; others have as many as 65. Many of them secrete an unpleasant smelling oil.

They like damp places and hide under stones or beneath the bark of trees. A few damage crops

and garden plants by eating the roots, but the majority, which feed on decaying vegetation, are harmless. Certain millipedes make nests to protect themselves from enemies while moulting. In other cases nests are made by the females to receive their eggs.

MILL ON THE FLOSS, THE, a novel of grim tragedy by GEORGE ELIOT; published 1860. As a child Maggie Tulliver, sensitive, living much in her imagination, is misunderstood by her good but stupid mother, by her manly brother, Tom, by her despicably conventional aunts and uncles—the Pullets, the Gleggs, the Deanes—and, indeed, by all with whom she comes in contact around Dorlcote Mill, except her father. The unhappiness of her childhood is not lessened later in life when she falls deeply in love with Philip Wakeham, the crippled son of Mr. Tulliver's bitterest enemy. Forced by her mother to swear that she will never again see Philip, the girl, soon after her father's death, leaves the scenes of her childhood. Returning later, she commits an indiscretion with Stephen Guest, her cousin's fiancé, for which she is severely condemned. When a great flood sweeps the valley of the Floss, Maggie, braving it in a small boat with her brother, goes to death unregretfully.

MILLS, ROBERT (1781-1855), American architect, was born at Charleston, S.C., Aug. 21, 1781. He received a technical education in his native city and in 1800-02 studied and worked at Washington under James Hoban, architect of the White House. After 1803 he was associated with Benjamin Latrobe, architect in charge of the construction of the Capitol. Mills's first noteworthy personal work was the Washington Monument at Baltimore, Md., for which he submitted the successful design in 1816. In 1820 he returned to South Carolina where he practiced civil engineering until 1825, when his design for the Bunker Hill Monument was accepted and he went to Charlestown, Mass., to superintend the construction of the shaft. He returned to Washington in 1830 and in 1836 was appointed by President Jackson architect of public buildings, a post which he held until 1851. His greatest works in this period were the Patent Office, the façade of the Treasury and the Washington Monument. Mills's design for the Monument called for a circular, columnar pantheon at the base and some 45 ft. greater height than the present structure, but these changes resulted from the abandonment of construction between Mills's death and 1878. Mills, with WILLIAM STRICKLAND, both pupils of Latrobe, were the two chief architects of the period of Greek revival in America. Mills designed a number of striking private houses, and developed the auditorium type of church popular in his period. He died at Washington, D.C., Mar. 3, 1855.

MILLS, CANE. *See* CANE MILLS.

MILLS COLLEGE, at Oakland, Cal., a privately controlled, undenominational college for women. It was founded as an academy in 1852 in Benecia. Purchased by Dr. and Mrs. Cyrus T. Mills in 1865, it was renamed Mills Seminary, and transferred to Oakland in 1871. The college was chartered 14 years later. Mills had productive funds in 1931 totaling $1,600,000. Included among the 56,500 volumes in the library is the Bender collection of rare books and manuscripts. In 1931-32 there were 515 students and a faculty of 81, headed by Pres. AURELIA H. REINHARDT.

MILLVALE, a borough of Allegheny Co., southwestern Pennsylvania, situated on the bank of the Allegheny River, opposite Pittsburgh. The borough is served by two railroads. Millvale has saw, box, toy and stamping factories. Population, 1920, 8,031; 1930, 8,166.

MILL VALLEY, a town in Marin Co., western California, lying at the foot of Mt. Tamalpais and situated near San Francisco Bay, 11 mi. north of San Francisco; the Northwestern Pacific Railroad serves the town. Mill Valley is a residential suburb of San Francisco, surrounded by fine scenery including Muir Woods. The Russians established the first sawmill in California here. The town was platted and incorporated in 1900. Pop. 1920, 2,554; 1930, 4,164.

MILLVILLE, a city of Cumberland Co., N.J., located on the Maurice River and on the Pennsylvania Railroad, 38 mi. south of Camden. It is the trading center for a prosperous truck gardening and poultry raising area. Its principal industries are the mining of sand and the manufacturing of glass and textiles. In 1929 the value of manufactures was about $7,000,000; the retail trade amounted to $6,988,168. Millville was founded in 1745 by Lucas Peterson and laid out in 1803. It was granted its charter as a city in 1866. Pop. 1920, 14,691; 1930, 14,705.

MILLWORK, the general term applied to the conversion of lumber into interior fitments for house and industrial construction. It includes such mechanical operations as are required on rough lumber to convert it to structural uses. Most rough lumber is planed to an even thickness for sheathing, FLOORING, siding and the like, and many uses require shiplapped or tongued and grooved joints. Interior trim includes all of the visible woodwork in a room or building, but does not include exterior woodwork exposed to the weather. It is usually reduced to size and shape on machines, and sometimes cut to length at the factory, or on the job. Plywood paneling and wainscoting are extensively used in better class dwellings and office buildings, as they lend more character than plastering or metal work. Wainscoting is often developed in highly figured wood and sometimes in parquetry and MARQUETRY effects.

The making of doors is an extensive trade in itself, as they may be of flush type, either solid or PLYWOOD; panel type with wood panels or of the French or glazed type with glass panels. The rails and stiles of panel doors may be either of solid wood, which makes the cheaper door, or of plywood, which gives much more beautiful effects and is less likely to vary in size under different climatic conditions. While panel doors come in an endless variety of panel effects and are used for every type of building, yet the flush door of plywood has been largely adopted

for hospitals, schools, hotels and public buildings. It is sturdier, more sound proof and fire resistant, offers less opportunity for the lodgment of dust and is more serviceable under heavy duty. T. D. P.

MILNE, ALAN ALEXANDER (1882-), English poet and playwright, was born in London, Jan. 18, 1882. He was educated at Westminster and at Trinity College, Cambridge. In 1903 he became a journalist in London, and in 1906 joined the staff of *Punch* as assistant editor. During the World War he served in France with the Royal Warwickshire regiment. He has been extremely popular as an author of verse for children, having written among other books, *When We Were Very Young,* 1924, *Now We are Six,* 1927, and *More Very Young Songs,* 1928. He has also published several novels and plays, the most popular of the latter being *Mr. Pim Passes By,* 1919, and *Give Me Yesterday,* produced in London and New York. Milne's novel, *Two People,* was published in America in 1931.

MILNER, ALFRED MILNER, VISCOUNT (1854-1925), English statesman, was born at Bonn, Germany, Mar. 23, 1854. He was educated in Germany and at Oxford, and became a barrister in 1881. He achieved prominence when he went to South Africa (1897) as high-commissioner and governor of Cape Colony. After the Boer War he helped in the establishment of a representative government for the Transvaal. In the World War, Milner again held important posts because of his experience and sagacity. He attended the Paris Peace Conference, and was one of the signers of the Treaty of Versailles. He was in public affairs until his death which occurred near Canterbury, May 13, 1925. Lord Milner was raised to the peerage in 1901.

MILO. *See* MELOS.

MILREIS, the Brazilian monetary unit, equivalent to 11.96 cents at par. A gold milreis valued at 54.62 cents has been issued but the paper milreis is the one in general circulation.

MILTIADES (died c. 488 B.C.), Athenian general. After an active military career in Thrace, Scythia and the region near the Hellespont, he returned to Athens in time to be chosen one of the ten Athenian generals when the Persian invasion led by Datis and Artaphernes threatened Greece. Realizing that if the Persians were permitted to attack Athens itself traitors from within might betray the city, Miltiades persuaded Callimachus, the polemarch or supreme commander, to meet the foe at MARATHON, where a glorious victory was won 490 B.C. Shortly thereafter in command of a fleet Miltiades attempted to regain control of the Aegean for Athens, but his failure at PAROS led to his impeachment. A fine of 50 talents was imposed upon him, which his son, the famous CIMON, subsequently paid. Miltiades died of a wound received at Paros.

MILTIADES or **MELCHIADES,** bishop of Rome, 311-314, an African saint who presided at a council at the Lateran against the schism of the DONATISTS at the instance of Emperor Constantine the Great.

MILTON, JOHN (1608-74), English poet, the eldest son of John and Sarah Jeffry Milton, was born Dec. 9, 1608, in his father's house, "The Spread Eagle," in Bread Street, London. His education was entrusted to Thomas Young, a Scotch clergyman who apparently intensified the boy's Presbyterian beliefs. When he was about 12 Milton entered St. Paul's school, then presided over by Alexander Gill, a notable classical scholar. At St. Paul's he made the acquaintance of Charles Diodati, destined to be, despite his short life, the poet's one intimate friend, and the subject of the first and sixth elegies. In these Milton reveals much of his youthful thought and of his struggle to maintain the austere way of life he had already chosen as the only one leading to the heights of literary attainment. At St. Paul's he began to write poetry, as the paraphrases of Psalms 114 and 136 indicate. On Feb. 12, 1625 he was admitted to Christ's College, Cambridge, where he took his B.A. degree Mar. 26, 1629, and his M.A., July 3, 1632. He found the uni-



MILTON'S COTTAGE AT CHALFONT ST. GILES
The only house now standing in which Milton is known to have lived

versity system of his day irksome; it forced him to hold back his desire to read in order to do the exercises assigned for the less precocious. His independent disposition early manifested itself in a dispute with his tutor, Chappell, which caused Milton's brief rustication. He never looked upon this punishment with shame, a fact which leads to the conclusion that he was penalized for an intellectual insubordination rather than for moral delinquency. By 1632 he had won the admiration of teachers and students alike, for he implies that he was urged to take orders, as his father also wished him to do, and to remain at Cambridge as a tutor. His general dislike for the university, however, made it easier for him to hold to his purpose to write of "things unattempted yet in prose or rhyme." Returning to his father's home, at Horton, he announced that his life was consecrated to poetry, and settled down for 6 years of that "select reading" he considered the preparation essential for a poet. Although his Cambridge days had been productive of, among other works, the *Ode on the Morning of Christ's Nativity,* the sonnet *On Being Arrived*

at the Age of Twenty-three, and the verses on the university career, indicate, the period at Horton marks the real flowering of his lyric genius. He gave utterance in *L'Allegro* and *Il Penseroso,* to his concept of the two conflicting ways of life—the worldly and the meditative, the pagan and the ascetic—with an eagerness so equal and so intense as to indicate that in his spacious spirit the two maintained a perpetually unresolved allurement. At the invitation of his friend Henry Lawes he contributed songs to the masque *Arcades,* presented in honor of the dowager Countess of Derby in 1633, and in 1634, again in response to Lawes' invitation, he composed that brilliant, earnest celebration of Platonic virtue, the masque *Comus,* as a compliment to the Earl of Bridgewater. In 1638 Milton contributed *Lycidas* to a volume issued at Cambridge to commemorate Edward King, a collegemate and a tutor in the university. A pastoral elegy in the manner of Theocritus, *Lycidas* shows the lyric powers of the poet at their highest development. It also foreshadows in its powerful attack on the Anglican clergy, the years of public life when Milton became the voice of the Puritan Revolution.

From Apr. 1638 until about Aug. 1639 Milton traveled on the Continent, stopping for a brief visit in Paris where he met Grotius, lingering longest in Florence and Rome, where his learning and linguistic skill won him unfeigned admiration, visiting Galileo, inspecting the treasures of the Vatican Library, falling under the spell of a beautiful singer whom he celebrated in some Italian verses, and finally journeying to Geneva. He had planned a further trip to Greece and Palestine but his belief that the Bishops' War was the beginning of the civil war led him back to England. On learning that an open break between King and Parliament had not yet taken place, he opened a private school in which his only pupils were his nephews Edward and John Philips. He added others later, and, as his *Tractate of Education* indicates, took the task of teaching seriously, but in 1647 his increasing part in public affairs caused him to abandon the project.

In June, 1643, Milton married Mary Powell, the daughter of an Oxfordshire gentleman, a girl 18 years his junior. The result was not happy. A month after the marriage the bride returned to her father's house where, despite her husband's requests for her return, she remained 2 years. Eventually friends effected a reunion that lasted in apparently unbroken goodwill until Mrs. Milton's death. Milton was married twice again; to Katherine Woodcock in 1657 (d. 1658), and to Elizabeth Minshull in 1663. The former was the subject of his tenderest poem, the sonnet *On My Deceased Wife.*

From 1641 to 1660 Milton devoted himself entirely to public life. His profound belief in the righteousness of the Puritan cause made it possible for him to put aside his life-long poetic ambitions, and "write with his left hand," that is in prose, either English or Latin. He championed what he called the three kinds of liberty: religious, domestic and political. In doing so he supported first the Presbyterians who sought to displace the Anglican Church with their own, and at the same time limit the power of the monarch; and later, when his radicalism became distasteful to this group, he fought for the Independents, the party entirely opposed to monarchy and in favor of complete religious independence. His first five pamphlets urged the unscriptural nature of episcopacy. Three of them, *Of Reformation Touching Church Government* (May, 1641), *Of Prelatical Episcopacy* (July, 1641), and *The Reason of Church Government* (Feb., 1642), argued the issue with earnestness, learning and a fair measure of calm. The others, *Animadversions Upon the Remonstrant's Defense* (July, 1641) and *Apology Against a Pamphlet Called a Modest Confutation . . .* (Mar., 1642), were bitterly controversial in tone and purpose. Turning his attention to domestic liberty, Milton produced six more pamphlets, four on divorce: *The Doctrine and Discipline of Divorce* (Aug., 1643), *The Judgement of Martin Bucer Concerning Divorce* (July, 1644), *Tetrachordon* (Mar., 1645) and *Colasterion* (Mar., 1645); *A Tractate of Education* (June, 1644); and *Areopagitica* (November, 1644) a defense of free press. The *Tractate,* written as a favor to Samuel Hartlib, chief English disciple of Commenius, shows Milton's debt to the latter, and indicates his antagonism to the educational methods of the day. *Areopagitica,* noblest of the prose works, was no doubt prompted by the fact that Milton had already published two divorce tracts without license. He traces censorship to the Inquisition, and argues its moral futility.

These works brought him local fame and not a little undesired notoriety, but with the appearance, a month after the King's execution, of his first political pamphlet, *The Tenure of Kings and Magistrates* (Feb., 1649) he achieved international reputation and won the immediate attention of the government leaders. In this brave and forceful essay he affirmed the responsibility of rulers to the will of the governed, and the necessity of subjects' calling undesirable rulers to account, if need be of putting them to death as traitors. Within a month Milton was appointed Secretary for Foreign Tongues, charged with the enormous task of defending the Commonwealth against the Stuart propaganda and with the diplomatic correspondence of the Council of State. He brought to his tasks vast learning, an uncommon control of languages, especially Latin, and a zeal neither money nor fear could buy. Despite the tragic realization that his sight was slowly going (he became totally blind in 1652), he cheerfully gave the richest years of his maturity to the service of the Independents because he believed that through them England would come into an age of complete political liberty and religious tolerance. Some of his argument was puerile, much of his language was scurrilous, and too often his bitterness of spirit was cruel in its expression, but in each of the tracts burned passion for the just triumph he visioned, and faith in its

temperature of 21° F. in January, of 70° F. in July. The average annual precipitation is 30.1 in.

Geographic Setting. The city is built chiefly on a series of bluffs in southeastern Wisconsin, extending in a wide bend 6 mi. along the lake front. The bluffs rise to between 85 and 150 ft. above Lake Michigan. Additional water front is provided along the Menominee, which flows south and east through the city, and along its extensive slips and canals. The Kinnickinnic, flowing east and north, also provides shipping facilities. The Milwaukee, the chief stream flowing through the city, is joined a short distance from its mouth by the Menominee, and farther south and nearer the lake, by the Kinnickinnic. All three streams have a depth sufficient for the maximum draft of Great Lakes shipping. Inland from the lake front the ground rises above the valleys of the three streams. These elevated areas comprise the residential districts.

Milwaukee's streets were laid out in an orderly arrangement in relation to the direct points of the compass. The business district lies chiefly between the harbor inlet and a point 2 mi. north, an area extending west to North Eleventh Street. In this district is the City Hall on Market Street, the $12,000,000 limestone County Courthouse, the granite Federal Building which cost $4,000,000, the Court of Honor, a broad plaza dedicated to the dead of American wars, and the vast Municipal Auditorium. The business streets are lined with modern buildings; among them are 40 hotels. West of the river is the building occupied by the Public Library adjoining the new Civic Center; this is the site also of the new Public Safety Building. Also in this district is the Union Station, immediately south of the Public Park. The new County Courthouse, a part of the Civic Center project, was erected at a cost of $12,000,000.

Outside the restricted area, west of the Milwaukee and south of the Menominee River, the numbered north-and-south streets are cut diagonally and at right angles by wide drives leading to the outlying sections. These drives include Fond du Lac, Hopkins and Prospect avenues, Capital Drive, and Juneau, Wisconsin, Oklahoma and National avenues. The park system, covering 1,230 acres, consists chiefly of Jackson, Washington, Evergreen, Lake, Humboldt, South Shore and Riverside parks. Juneau Park, extending along the lake bluff, contains a statue of Leif Ericsson. Other celebrated statues in Milwaukee are those of Solomon Juneau, Goethe, Schiller, Burns and Kosciusko.

Transportation. The industrial and commercial importance of Milwaukee has been due to the excellence of its water and rail transportation facilities, and to the industriousness of its large German population. In 1930, 7,703,182 tons of commodities passed through the harbor. The city is served by the Chicago and Northwestern, Chicago, Milwaukee, St. Paul and Pacific, Chicago, North Shore and Milwaukee, the Grand Trunk, the Pere Marquette and the Soo Line railroads and the Milwaukee Electric Railway. The harbor, with its generous anchorage in Milwaukee Bay, is open the entire year and is a regular port of call for nine steamship lines. The inner harbor is equipped with 29 coal-receiving plants and 18 terminal warehouses. Maitland Airport occupies a tract of land north of the entrance to the inner harbor. The three rivers are crossed by 28 viaducts and bridges, the most modern being the Cedar-Biddle Streets Bridge over the Milwaukee River. Within the city transportation is provided by street railways and buses.

Industry and Commerce. In 1929 the value of manufactures in Milwaukee was about [illegible] and was produced by approximately [illegible] establishments. The leading manufactures, in importance, are heavy machinery, tinware, leather, motorcycles and automobile frames, shoes, stockings, toilet soaps and candy. Flour and feed, corn, and wheat are shipped in vast amounts from the lake port, and coal and steel are received, resulting in the large steel-manufacturing industry. The large brewing industry came to an end with the advent of prohibition, but products now manufactured in the old brewing plants exceed in value the former production. During 1929 the retail trade amounted to $347,422,233; the wholesale trade proper, to $297,823,254. In 1930 Milwaukee, county and city, had a wholesale trade valued at approximately $551,552,029.

History. Although the Milwaukee site was apparently visited by Father Marquette and by La Salle, no permanent white settlement was established until 1818, in which year Solomon Juneau erected a log cabin on the east bank of the Milwaukee River. The site was then occupied by the Pottawattamie Indians. In 1833-34 a white settlement grew up, and in 1838 Juneau's community was organized as a village and named Milwaukee, a corruption of the Indian name "Milleoki," for the river flowing from the north. It was incorporated as a city in 1846, Solomon Juneau becoming first mayor.

MILWAUKEE-DOWNER COLLEGE, at Milwaukee, Wis., a privately endowed, undenominational college for women, is a union of Milwaukee College, chartered in 1851, and Downer College, chartered at Fox Lake, Wis., in 1855. The amalgamation of the two institutions was brought about in 1895 by Ellen C. Sabin, then president of Downer College. Milwaukee-Downer has an endowment of $1,276,303. The library contains 25,761 volumes. In 1930 there were 382 students enrolled, and a faculty of 46, headed by Pres. Lucia R. Briggs.

MILYUKOV, PAVEL NIKOLAYEVICH (1859-), Russian historian and publicist, was born at St. Petersburg, Jan. 27, 1859. Milyukov studied history under Klyuchevski at the University of Moscow, where he later served as instructor in Russian history. His first published work, 1892, was a dissertation on the Russian national economy under Peter the Great, which he followed with a study of taxation in the Muscovite state. In 1895, he was relieved of his duties at the University for affiliation with certain student societies, and settled in Ryazan. He immediately published his two scientific works, *Leading Tendencies of Russian Historical Thought* and *Outlines of the*

History of Russian Culture, both of which possess marked permanent merit. Toward the close of the 90's he was summoned to the chair of history at the University of Sofia, where he began his studies of Balkan problems and of the broader field of international politics. Upon his return to Russia, he gave himself up entirely to political and journalistic activity. He was not only editor of the St. Petersburg daily *Rech* but, as a leader of the Constitutional Democratic Party, "Cadets," was a prominent member of all the Dumas. In 1916, he came to the fore with a violent attack on the "dark forces" behind the Sturmer cabinet, and after the Tsar's abdication, he was Minister of Foreign Affairs in the Provisional Government. Making his escape abroad amid the disorders of 1917, he became the editor of the liberal émigré newspaper *Poslyedniy Novosti,* published in Paris.



MIMICRY. Among the myriad forms of insects, many resemble natural objects in their environment, such as sticks, leaves and plant-spines, for which they may be mistaken by their vertebrate enemies. That they profit by such disguises may be inferred from the fact that they behave, when at rest, as if they were in fact sticks, leaves or spines. The stick insect when attacked, or otherwise disturbed, stretches its lanky legs forward and backward and, like a straight twig, holds itself rigid in a death feint. The spine-like leaf-hoppers rest on the stem of a vine or a twig in positions proper to the disguise.

MINARET OF MOSQUE OF ST. SOPHIA, CONSTANTINOPLE

Less convincing, possibly, are those numerous cases of resemblances of harmless, edible insects to those believed, or known, to be inedible to birds, the so-called Batesian mimicry. Thus an American butterfly, the viceroy, differs in color from the purple or black species of its own genus, or kind, and superficially yet strikingly resembles in color the tawny monarch, which is thought to be extremely distasteful to birds.

Even more numerous in the tropics are the cases of superficial color resemblances between really unlike butterflies, both of which are regarded as inedible. The theory of Fritz Müller holds that they profit by the fact that a bird or other enemy learns from experience with either one of them to avoid both.

J. H. G.

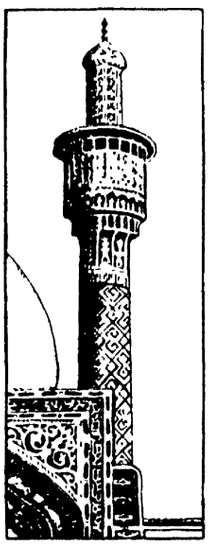
MIMOSA, a very numerous genus of herbs, shrubs and trees belonging to the mimosa tribe of the pea family. There are some 400 species, native almost exclusively to tropical and subtropical America, only a few of which are of economic importance though many are grown in warm regions for their ornamental foliage. The fruit is a true legume like that of the pea and senna, but the flowers are small, regular and borne in dense heads. The leaves, bipinnately divided into numerous leaflets, are often sensitive and exhibit remarkable sleep movements. In the sensitive plant (*M. pudica*) these movements can be readily induced by a slight blow. The plants commonly grown by florists as mimosas are acacias, chiefly varieties of *Acacia armata,* the Kangaroo-thorn.

MIMULUS, a large genus of herbs and shrubs of the figwort family several of which are grown as garden ornamentals. There are about 115 species widely distributed in both hemispheres and especially numerous in western North America. Though several are small shrubs, most species are spreading or erect herbs, often viscid or clammy-hairy, bearing opposite leaves and more or less showy, usually yellow or red flowers. Among the western American species more commonly cultivated are the common monkey-flower (*M. guttatus*), the yellow monkey-flower (*M. luteus*), the bush monkey-flower (*M. aurantiacus*) and the musk plant (*M. moschatus*).

MINAEAN, an extinct SEMITIC language of the South ARABIC group preserved in inscriptions from the kingdom of Maïn. In grammar and vocabulary it is akin to ETHIOPIC and ARABIC, but differs from the latter in its alphabet (29 consonants), and in prefixing *s-* to the causative and to the pronoun of the third person.

BIBLIOGRAPHY.—F. Hommel, *Süd-arabische Chrestomathie,* 1893.

MINARET, a tower, or tower-like structure, connected with a Mohammedan mosque, and built to give an elevated stage or gallery from which the muezzin could chant effectively the call to prayer. The earliest minarets were comparatively wide and low; but a search for continually greater height and slimness characterized the development in all the styles of Mohammedan architecture. In Moorish countries the minarets are usually square in plan, with the top bearing a smaller lantern or decorative crown. In Persia and Turkey the plan is usually round, with one or more intermediate galleries bracketed out from the structure. Persian minarets are usually topped with a small open arcaded structure. Many important mosques have more than one minaret; the Ahmediyeh mosque in Constantinople has six; that of Mecca, seven.



PERSIAN MINARET

MIND, the sum total of mental life, a cross section of consciousness; the aggregate of processes connected with the functioning of the brain and the nervous system. The second conception states physiologically and neurologically what is involved psychologically in the first conception. Any definition of mind depends largely on the philosophy or psychology adopted. Some psychologies do not admit the existence of

mind; in others it is the central idea. Another stresses the importance of the subconscious mind as over against the conscious life: also there are psychologies which regard mind as a specific function representing the adjustment process. Here it becomes practically synonymous with intelligence. A further restriction in still another psychology would confine it to thinking and purposive action.

Historically, the mind has been distinguished from the body. It represented consciousness as over against material existence. In its broader meaning it included the entire field of consciousness. Any state of awareness was something mental. Consciousness could be approached either from the standpoint of its content or from that of its activity. The one view would stress mental states, the other mental functions. The so-called faculty psychology regarded the mind as a substance in which mental states inhere. This substance comprised a number of faculties, such as memory, imagination and reasoning. These faculties could be strengthened by their exercise just as one could strengthen a muscle by putting it to work. Thus arose the idea of formal discipline in education. The theory of mind as a thinking substance with separate faculties has long been completely discredited.

The mind has been regarded as a blank tablet on which impressions were registered. It was wholly passive in character and there was nothing in the intellect save what was first contained in the senses. This position, taken by Locke, is typical of associationist psychology. The apperceptive psychology gave the mind an activity of its own. To Locke's statement, "There is nothing in the intellect save that which is contained in the senses," Leibniz added, "but the intellect itself," which made a vast amount of difference. Kant tried to put some meaning into Leibniz's "bare intellect" and conceived of the mind as essentially an activity. It had its forms which it applied to nature by means of its categories.

With the change from a rational to a voluntaristic psychology the same controversy has been given a different emphasis. Behaviorism represents the passive side of the question, while the activity end is upheld by the Gestalt psychology. From the standpoint of behaviorism the mind is a mechanism; in the Gestalt psychology emphasis is placed upon the mind's constructive activity. The one would view it in terms of stimulus and response relation. The other would take the position that response determines stimulus as much as stimulus determines response. Stimulus and response affect each other and are changed because of this relation. R. N. B.

BIBLIOGRAPHY.—B. Russell, *The Analysis of Mind* (1924); B. H. Bode, *Conflicting Psychologies of Learning* (1929).

MINDEN, a German city in the province of Westphalia, about 40 mi. west and south of Hanover, on the Weser River. The 13th century cathedral is a masterpiece of early-Gothic style and has old paintings of great value. The 13th century rathaus has a fine Gothic façade. Minden produces glass, soap, machinery and leather goods and has trade in grain and cattle. It was mentioned in 789; Charles the Great founded the bishopric; in 1295 it became a Hanseatic city. Pop. 1925, 27,139.

MINDEN, a city in northwestern Louisiana, the parish seat of Webster Parish, situated 30 mi. northeast of Shrevesport and served by the Louisiana and Arkansas Railroad. Minden is a shipping center for lumber, cotton and oil, with railroad shops, cotton compresses, canneries and sawmills. It was founded in 1832 and named for Minden, Germany. Pop. 1920, 6,105; 1930, 5,623.

MIND READING, a general term describing the alleged power of one mind to read another apart from the recognized avenues of sense. On the one hand, it refers to the art of MUSCLE READING; on the other, it proposes the theory of TELEPATHY. The stage performances of mind reading depend upon the use of a code in phrase, posture or gesture, on electric connections, on duplicated impressions on written slips, and other devices.

MINE DEVELOPMENT, the preliminary working of a mine. It follows exploration (*see* MINE EXPLORATION) which gives only a rough idea of the position, size and value of a mineral deposit. The purpose of development work is two-fold: first, to definitely delineate the ORE DEPOSIT and prove its commercial value; second, to open up the mine and prepare it for economical extraction of ore. Many failures in mining can be traced to insufficient development. Frequently, optimism blinds the owners, and the necessity for proving and preparing the mine is lost sight of in a desire to start production at the earliest possible moment.

Certain MINERAL DEPOSITS, such as flat iron-ore bodies, sheets of lead and zinc ore and disseminated copper deposits, can be satisfactorily proved by boring (*see* DRILLING). In most cases, however, slow and expensive underground operations are necessary for the final development.

The first point to be decided in development work is the method of entry. In a mountainous country with favorable topography, the most advantageous means is by tunnel; this drains the mine and obviates the necessity of pumping and of hoisting. In most cases, especially in deep mines, entry must be gained by a SHAFT. This may be vertical or inclined. If vertical, CROSSCUTS or DRIFTS from different shaft stations are required in order to penetrate the ore body. During preliminary development, inclined shafts which follow the ore are most appropriate. In the most important mining operations, vertical shafts are usually employed.

Good mining practice requires at least two entries to provide ventilation (*see* VENTILATION, MINE) and an emergency exit and to facilitate development and exploitation. At certain intervals, shaft stations are provided; these are the outlets of the levels to the shaft, the levels being 50 to 150 ft. apart. They must be sufficiently large to permit loading, switching of mine cars and lowering of timber. From these stations, crosscuts are run to connect the drifts with the

shaft. Other crosscuts may connect different workings on one level, or serve exploration purposes for the search of parallel ore bodies.

The drifts are galleries, or tunnels along the ore body. Originally serving to prospect the deposit, they are finally the main roadways and bases for stoping (*see* STOPE) operations. For prospecting and stoping purposes, they should follow the ore; as roadways, a straight gallery is, naturally, more desirable. For this reason main haulage drifts are frequently driven in large deposits and are separate from the drifts which furnish the stoping base.

At not too distant intervals, the drifts are connected with each other. It is always better to effect such a connection by driving a RAISE, instead of by sinking a WINZE; the former operation is more economical, as it does not require pumping nor the lifting of broken ore or rock. The number of raises and winzes depends upon the stoping method in use; but they also serve as passageways for air, material and men.

Drifts, winzes and raises divide the ore body into blocks. Ore thus blocked out can be appraised, its tonnage calculated and its value estimated by means of a systematic SAMPLING of the exposures. This makes it possible to determine the value of the mine, as well as the methods of operation and the size and character of the ORE TREATMENT plant needed. At the same time, the mine is prepared for ore extraction.

The term "productive development" is applied to workings driven in ore; workings driven in the COUNTRY ROCK, such as crosscuts, are termed "dead work." The ideal condition of development is a minimum of dead work and the blocking out of a maximum amount of ore per unit of development work. *See also* MINING, METAL. B. L.

BIBLIOGRAPHY.—H. C. Hoover, *Principles of Mining;* G. J. Young, *Elements of Mining.*

MINE EXAMINATION, the inspection of a mining property, generally undertaken for the purpose of determining its value. The value of a metal mine depends upon the profit which can be derived from the extraction of the ORE; this profit, in turn, will depend upon the amount of available ore and its average metal content.

In a developed mine (*see* MINE DEVELOPMENT), the tonnage of blocked-out ore can be calculated with fair accuracy, but an undeveloped property cannot be properly appraised. To determine the average grade of the ore, systematic SAMPLING is carried out. The average metal content, thus established, multiplied by the tonnage gives the gross metal content. The recoverable metal content will be less, due to losses in concentration and smelting. (*See* ORE TREATMENT.)

The operating costs have to be accurately estimated to calculate the profit. The trend of metal prices and market conditions must, of course, be taken into consideration. *See also* MINING, METAL. B. L.

BIBLIOGRAPHY.—H. C. Hoover, *Principles of Mining;* C. S. Herzig, *Mine Sampling and Valuing.*

MINE EXPLORATION, an investigation to determine, in a preliminary way, the position, size and value of a MINERAL DEPOSIT. It follows PROSPECTING, the search for a deposit, although prospecting frequently is used synonymously with "exploration." When the exploratory work gives sufficient encouragement, it is followed by MINE DEVELOPMENT, whereby the value of the deposit is more definitely determined and the property simultaneously prepared for the extraction of ORE.

Exploration work is divided into surface and underground methods. The former are applicable where the deposit comes to the surface or is overlain by only a thin layer of soil or other debris. In such cases, the initial exploration workings consist of trenches, which are dug at regular intervals, usually across the trend of the deposit. These cut through the surface debris and expose the underlying formation. Such a series of trenches across a deposit will give an idea of its length, width and mineral content at the surface. To determine the persistency of the deposit in depth and its size and grade below the surface, small shafts are sunk, or, where the topography is favorable, tunnels are driven. Where possible, tunnels follow the course of the vein, and where the tunnel intersects the ore, DRIFTING is done along the vein.

When a thick surface cover makes trenching impracticable, shaft sinking, followed by drifting, is employed. Frequently, boring (*see* DRILLING), with diamond drills or other boring machines, precedes shaft sinking. Boring gives quick results at low cost, but in most cases is not conclusive and has to be followed by underground exploration.

In PLACER deposits, as well as in some disseminated copper deposits, systematic boring will not only explore the deposit, but will make possible an accurate estimate of its size and grade.

All ore exposures disclosed by exploratory workings are systematically sampled to determine their metal content. The diamond drill cores which contain ore are split in half, one half constituting a sample which is assayed, the other half is kept as a permanent record. *See* SAMPLING.

The valuation of a property which has not gone beyond the stage of exploration, constitutes a difficult problem. Until the ORE DEPOSIT has been properly developed (*see* MINE DEVELOPMENT), an accurate estimate of the tonnage and value of ore is impossible. Geological conditions and available ore exposures may fully warrant further exploration and later development of a property, but an enterprise in the stage of exploration must be considered as highly speculative. The expected profits which would result from a favorable outcome must therefore be commensurate with the risk undertaken.

In recent years, geophysical methods of prospecting and exploration have been developed, by means of which the presence of underground deposits can often be detected (*see* GEOPHYSICS). The methods most applicable to metal mining are either magnetic or electric. No geophysical method can tell what kind or grade of mineral is present; such work must be followed by underground exploration or drilling. In

all exploration work, including geophysical prospecting, a study of the local geology is essential. *See also* MINING, METAL; GEOLOGY. B. L.

BIBLIOGRAPHY.—Robert Peele, *Mining Engineers' Handbook;* C. S. Herzig, *Mine Sampling and Valuing;* C. G. Gunther, *The Examination of Prospects,* 1912.

MINEOLA, a village included in the town of North Hempstead, and county seat of Nassau Co., situated on the western end of Long Island, 10 mi. east of Brooklyn. The Long Island Railroad serves the village. Mineola is the seat of the United States Aeronautic Camp. Roosevelt and Mitchel Aviation Fields, located near Mineola, are important aeronautical centers. Pop. 1920, 3,016; 1930, 8,155.

MINERAL DEPOSITS, natural, geologic bodies consisting mainly of a single useful mineral, or containing valuable minerals which it is useful to extract. Bodies worked for an aggregate of minerals, a rock, are designated as DEPOSITS of that rock, but are nevertheless included in this discussion. In general, the term mineral deposits includes both metallic and non-metallic minerals; ORE DEPOSIT is used to designate the natural concentrations of those minerals used for the extraction of metallic elements.

Any one of several classifications may be adopted for mineral deposits, based for example on use, commercial importance, geographic or geologic distribution, form and structure, composition or origin. The most logical division seems to be that based on origin, a division which has the added advantage of emphasizing principles and genetic relationships, extremely useful when studying a district and PROSPECTING to locate new deposits.

Mineral deposits are formed and modified by practically all geologic processes. Three principal ones may be named. The first is through the agency of hot solutions or melts, given off from molten intrusions of IGNEOUS ROCKS. Most of the ores of the common metals, except iron and aluminum, are formed in this manner. The sorting effect of SEDIMENTATION, responsible for deposits of sandstone, shale and limestone, is also responsible for the preponderance of the values of mineral deposits, including the organic deposits, such as COAL and PETROLEUM. In this general group belong the great IRON deposits of the world. Here evidently belong the LIMESTONE beds, GYPSUM quarries, CLAY beds and SLATE quarries. The third type consists of those formed through the WEATHERING of rocks and consequent concentration of residual minerals in place, as in many PHOSPHATE, BAUXITE and LIMONITE deposits; or their transportation and redeposition elsewhere by water, as GOLD or PLATINUM placers, for example, or BORAX deposits.

Water itself, because of its domestic and industrial uses, and by reason of its utilization as a power source, is probably the most important mineral deposit.

Ultimately all minerals are derived from igneous sources within the earth's heated interior, but superficial processes of weathering and sedimentation are frequently responsible for their concentration into exploitable deposits. The study of mineral deposits is the province of economic GEOLOGY. *See also* MINERALOGY; PETROLOGY. S. F. K.

BIBLIOGRAPHY.—W. H. Emmons, *Principles of Economic Geology,* 1918; W. Lindgren, *Mineral Deposits,* 1919; Raymond B. Ladoo, *Non-Metallic Minerals,* 1925.

MINERAL ELEMENTS IN FOOD. *See* FOOD, MINERAL ELEMENTS IN.

MINERALOGY, the science which treats of the origin, characteristics, classification and identification of minerals, the materials out of which the rocks and soils of the earth are made. According to James D. Dana's definition, a mineral is a naturally occurring, inorganic, homogenous substance of definite chemical composition. Interest in these substances dates back to great antiquity, a natural consequence of the early discovery that metals could be derived from certain minerals. Homer reveals that the ancient Greeks made use of silica, alabaster, gold, native copper and native iron, that they knew the magnetic iron ore, magnetite, and extracted lead from its ores. Aristotle, Theophrastus and the elder Pliny were among the first to write specifically about rocks and minerals. Treatises existed in India prior to the sixth century, dealing with the sources, properties and counterfeiting of precious stones. During the so-called Dark Ages the Arab alchemists were the only workers to make progress in mineralogy, especially along chemical lines. Little else was done until the 17th and 18th centuries when great strides were made in the knowledge of the crystallography, chemical composition and physical properties of minerals, largely through the efforts of the crystallographers Nicolas Steno, Romé de l'Isle, René Haüy, the chemists Kronstadt, Berzelius, Bergman, and the geologist Abraham Werner. During the 19th century optical methods for studying minerals were developed by such pioneers as Brewster and Zirkel. The great systematic classification of minerals was made during 1837-68 by Professor Dana of Yale University.

Determinative Mineralogy. The simplest introduction to mineralogy is through the study of such physical properties as those emphasized by Pliny and Werner, the color, luster, hardness and weight of minerals, their cleavage and shape, or crystal form. Of these, the color is the first property observed, but is not always a distinctive characteristic. Some minerals always show the same color, as malachite which is green, or blue azurite, but others which are tinted by inclusions, pigments or other impurities may show a wide variety of color. This is especially true of the normally colorless minerals, such as quartz and calcite. Purple quartz is known as amethyst, for example, and the yellow variety, citrine, may simulate the topaz. Many minerals are indistinguishable on the ground of color, as augite and hornblende which are both the same dark green to black.

Also connected with the effect of light is the property known as luster, by which is meant the appearance of the mineral's surface in reflected light. Lusters are divided into metallic and non-metallic, the former being shown principally by such sulphides as pyrite

and galena, whereas the oxides, silicates, carbonates and so forth, possess mainly non-metallic lusters. These are divided into adamantine, like the hard, brilliant reflection of the diamond; vitreous or glassy, like quartz; resinous, like sphalerite; greasy, exemplified by nephelite; pearly, or resembling mother-of-pearl, due usually to a platy structure as in talc; silky, the result of a fibrous structure well shown in asbestos; and dull or earthy, like chalk or kaolin. In some minerals the luster may be different on different CRYSTAL or CLEAVAGE faces.

Sometimes minerals with practically the same color can be differentiated on the basis of their streak, or color of the powdered substance. This can be determined by scratching them, or by rubbing them on a piece of unglazed porcelain. Thus magnetite has a black streak, and franklinite a red to brown one. Most of the large group of rock-forming minerals, however, have a white powder. The ease or difficulty with which the streak is obtained serves also as a guide to the mineral's hardness, but the best test of this property is by comparison with the standard hardness scale, called Mohs' scale. This is a series of ten minerals arranged in order of increasing hardness and numbered accordingly from 1 to 10. They are talc, gypsum, calcite, fluorite, apatite, feldspar, quartz, topaz, corundum and diamond. The intervals in this scale are not equal, the difference between corundum and diamond being greater than that between talc and corundum; nevertheless it serves its purpose satisfactorily. For rough approximations, the finger-nail has a hardness of 2.5, a copper coin of 3, and a knife blade or window-glass of 5.5. In using Mohs' scale, the hardness of a mineral is that lying between the scale mineral it scratches and the one that scratches it. Occasionally minerals are found whose hardness will differ on different crystal or cleavage faces, or with the direction in which the scratch is made, or with the form in which they occur. Boracite, for example, has a hardness of 7 when crystallized, but of only 4.5 when it is in masses.

Other physical properties of importance in identifying minerals are specific gravity, transparency, play of colors, as seen in opals and labradorite, opalescence, such as shown by the moonstone, odor and taste. The feel or touch is occasionally of use, some minerals, like metals and gems, feeling cold, others greasy as talc and graphite, while chalk feels harsh. The tenacity and fracture are also observed, tenacity referring to the behavior of minerals when they are broken or bent, and fracture to the quality of the broken surface. Among kinds of tenacity may be mentioned brittle; sectile or easily cut; malleable or easily hammered without breaking, like copper; flexible or easily bent; and elastic, like mica that will spring back into position after being bent. Fractures are conchoidal or curved, as in quartz, even, uneven, hackly, with many sharp points, splintery and earthy, or showing an earthlike surface, as when chalk is broken. A few minerals are magnetic, the more important ones being iron-bearing, such as magnetite and pyrrhotite. The latter may be distinguished from pyrite by means of this property.

A distinctive characteristic of many minerals, closely related to crystal form and internal atomic structure, is their cleavage, or ability to split or separate easily and smoothly along certain planes parallel to possible crystal faces. Halite and galena, for example, cleave parallel to cube faces. On the other hand, quartz has no cleavage. Augite can be distinguished from hornblende because it has two cleavages which intersect at practically right angles, whereas in hornblende they are at an angle of 124°. It is not always necessary to obtain cleavage surfaces in order to identify the cleavages present, as small cracks which develop parallel to them often reveal the desired information.

Finally, the crystal forms in which minerals occur are often of the greatest importance in identifying species, and in yielding information about the relationships between them. Thus, referring again to the similar augite and hornblende, which are both monoclinic, augite is usually found in short, prismatic crystals, whereas those of hornblende are inclined to be longer. Orthoclase, for example, is distinguished from the plagioclase feldspars by being monoclinic, whereas the plagioclases are triclinic. Crystals are rarely found among the rock-forming minerals but often there will be slight indications of two or more faces which permit placing the specimen in the proper crystal system. Where the conditions of growth are more favorable, as in veins, pegmatites and cavities, beautiful crystals sometimes form, such as amethyst in cavities and beryl in pegmatites. A few minerals, such as opal, are noncrystalline, or amorphous.

Intimate knowledge of the aforementioned characteristics of minerals is usually sufficient to enable the geologist or mineralogist to identify at sight the great majority of common rock-forming ORE and GANGUE minerals, without applying further tests. If not, a field blow-pipe outfit may be used. This consists of a small tube through which a stream of air is blown from the mouth so as to direct the flame of a gas-burner, or oil or paraffin lamp, upon the specimen to be tested. The sample, consisting of a few grains, is supported on a piece of charcoal, plaster or mica. The presence of certain elements is indicated by characteristically colored coatings on the support just beyond the flame. The effect can often be varied, checked and improved by using chemical reagents mixed with the specimen. With a mica or plaster support the coatings, or sublimates, can be subjected to chemical tests. Other tests involve observing the coloration imparted to an open flame by the mineral, certain elements producing characteristic colors therein; noting the reaction of the substance when heated in a small glass tube, either open or closed at one end, changes in color and

COMMON FORM OF BLOWPIPE

evolution of gases or sublimates often being indicative of some of the elements present. A valuable diagnostic is the color given by a grain or two of the specimen to a small bead of molten borax, or of salt of phosphorus. The molten bead is held in the flame on the tip of a platinum wire, and certain metals, when present in the mineral, give it characteristic colors, such as blue when the compound contains cobalt, or green when it includes chromium. There are other special tests, easily applied in the field, such as applying an acid to test for carbonates; this causes them to effervesce, due to the evolution of carbon dioxide.

All these tests are evidently qualitative in character. If quantitative data are required, or it becomes necessary to apply more refined tests, or rare minerals are under study, recourse must be had to the standard chemical methods of quantitative analysis. In the case of ore specimens the ASSAY is resorted to in order to determine the actual amount of valuable metal present in weighed quantities of the ore.

The introduction of the petrographic microscope about 1860 provided a new instrument for the differentiation of minerals and the study of the changes to which they are subjected. By its use the optical properties of minerals, discussed in the article CRYSTALLOGRAPHY, are studied, these usually serving as definite, diagnostic criteria. The various combinations of minerals which go to make up the rocks of the globe are clearly revealed, and the manner of their association elucidated, as well as the transformations they undergo in the processes of WEATHERING and METAMORPHISM. These studies are part of the science of PETROLOGY.

Classification. The chemical composition, crystal system and habit, and optical properties are of prime importance in systematically classifying minerals. These principles as set forth by Dana in 1868 are still followed; he gave preeminence to chemical characters, next to crystallographic ones, and then to various physical properties. The mineral kingdom is accordingly divided into several classes: native elements, as gold, and carbon in the form of diamond and graphite; sulphides and related compounds, such as pyrite, arsenopyrite, calaverite; sulpho-salts, sulphides of metals with arsenic, antimony or bismuth, such as tetrahedrite; haloids, salts of chlorine such as halite, of fluorine as fluorite, and of bromine or iodine; oxides, such as silica or hematite; oxygen salts, principal among which are carbonates including calcite, silicates such as feldspars, phosphates such as turquoise; salts of organic acids; hydrocarbon compounds, as petroleum or amber. There are sub-groupings within the classes, some being based on the principle of isomorphism, or similarity of chemical and crystal characters.

Origin and Importance. Origin plays no part in the above classification, but to the geologist, capitalist and statesman, it is often of prime importance. Minerals may form under a variety of physical conditions running the gamut of terrestrial temperatures and pressures. Some, like salt, are deposited from solution at the earth's surface, or by organic agencies as in the case of limestone and chalk. At the surface, but in the higher temperatures of hot-springs and fumaroles, there are formed such minerals as calcareous tufa and the metallic ores realgar and cinnabar, and native sulphur. By far the larger part of the ore minerals, however, is the product of crystallization from hot solutions or fusions, either in openings and fissures in the rocks, such as chalcopyrite, galena, sphalerite, gold and others, or as a segregation in the parent IGNEOUS ROCK, like the chalcopyrite-pentlandite (copper, nickel) ores of Canada. The rock-forming minerals themselves are mostly silicates which gradually solidify as the MAGMA, the molten mass in which their constituents are present, cools off. Typically they are quartz, feldspars, micas, amphiboles and pyroxenes. Most of the SEDIMENTARY ROCKS, are formed of mineral substances derived from preexisting rocks by weathering. This process is also responsible for new minerals, formed as a result of the solution and alteration of the substances it attacks. Thus pyrite may turn to limonite, and feldspar become a mass of kaolin. Other mineral transformations are brought about by metamorphism which, by pressure and heated solutions, changes the mineral composition of many rocks upon which it acts; pyroxenes pass over to amphiboles, and orthoclase to sericite and quartz, for example.

In recent years much light has been thrown on the conditions surrounding the formation of many minerals through experiments at geophysical laboratories. Various temperatures and pressures are employed with numerous reagents to create artificial minerals, determining under what conditions they originate far within the earth's crust, beyond the scope of ordinary investigation. On the commercial side, for example, artificial rubies and sapphires are made by fusing pure aluminum oxide, or corundum.

The importance of minerals to the modern world can hardly be overestimated. Metals, coal and petroleum are derived from MINERAL and ORE DEPOSITS, and aggregates of minerals form the rocks which are quarried for roads and buildings. The manufacture of concrete, bricks, glass, porcelain and refractories demands the correct mineral combinations, and the very soil used to grow the food of the world must contain the proper minerals for the nourishment of the desired plants. When it does not, the deficiency must be made good by fertilizers, themselves often mineral products. Not all parts of the world present equally favorable geological conditions for the occurrence of necessary minerals, principally metal ores, fuels and fertilizers, and thus certain countries must have access to exploitable deposits. This necessity has helped to develop the trade of the world; it has also provoked military conquests and "peaceful penetrations" since the beginning of history. *See also* CHEMISTRY; GEM STONES; GEOCHEMISTRY; GEOLOGY; MICROSCOPE; PRECIOUS STONES. S. F. K.

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MINERAL WATER, spring water carrying in solution mineral matter of known or supposed medicinal value. Such waters are usually sufficiently impregnated to have a distinctive taste, color, or odor. Mineral springs are classified according to their temperature. Thermal-spring water possesses in general more power to dissolve mineral substances out of the rocks than those of non-thermal springs. The waters are alkaline, alkaline-saline, saline, or acid, and are valued in the treatment of gout, rheumatism, dyspepsia, and other ailments.

The therapeutic use of mineral waters goes back to ancient Greek practice. The Romans discovered important springs in Italy as well as the famous spas of Bath, Baden-Baden, and Aix-la-Chapelle. Since the 18th century, the curative properties of springs in Virginia and at Saratoga, N.Y., have been recognized. A brilliant social life for a long time centered about these spas. More recently, the waters have been bottled extensively for use at a distance from their source.

The World War, by cutting off supplies from Europe, greatly stimulated the American mineral water industry. Of the 10,000 springs in the United States, between 800 and 1,000 reported sales. The majority of the commercially important springs rise east of the Mississippi river or on the Pacific coast. Among the more valuable are those at Hot Springs, Arkansas, Waukesha, Wisconsin, Las Vegas, New Mexico, and Medical Lake, Washington. Foreign mineral waters largely imported into this country are Vichy, from France, Apollinaris, from Ahrweiter, Germany, Hunjadi-Janos, from Budapest, and Kissingen, from Bavaria.

MINERAL WELLS, a city and noted watering place in Palo Pinto county, north central Texas. It is situated near the Brazos River, 45 mi. west of Fort Worth. The city is served by bus lines and two railroads. Fruit, grain and cotton are the leading crops of this region, and the city has flour and planing mills, a large water bottling plant and a brick yard. Mineral Wells entertains more than 150,000 visitors who come here every year to use the medical mineral waters, said to analyze almost identically with the waters of Carlsbad. It was surrounded by delightful scenery, Lake Pinto, Elmhurst Park and Lovers' Retreat. The city was settled in 1880 and incorporated five years later. Pop. 1920, 7,890; 1930, 5,986.

MINER'S DISEASE. *See* PNEUMONOCONIOSIS.

MINERS' LAMPS, lamps carried by miners to illuminate their work. In metal mines, candles, oil lamps and especially carbide lamps are frequently used. In gaseous coal mines SAFETY LAMPS and electric lamps are employed. Electric cap and hand lamps use batteries, which may be mounted on the miner's belt.

MINERS' LETTUCE (*Montia perfoliata*), a low, succulent annual of the purslane family called also Indian lettuce. It is abundant in damp shady places from British Columbia to Lower California and eastward to Arizona and Sonora. The plant grows usually from 4 to 10 in. high with several erect or diffuse stems bearing numerous long stalked basal leaves and a single perfoliate leaf below the narrow clusters of small white flowers. Miners' lettuce, which is closely allied to the garden PURSLANE and the SPRING BEAUTY, is sometimes grown for salads.



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MINERS' LETTUCE

MINERSVILLE, a coal mining center, borough of Schuylkill Co., southeastern Pennsylvania, situated on the Schuylkill River, 4 mi. west of Pottsville. Two railroads serve the city. The chief industry is anthracite coal mining and clothing is also manufactured. Pop. 1920, 7,845; 1930, 9,392.

MINE RUN, or run of mine, the ore as mined and hoisted to the surface, prior to sorting, or separation of the waste rock. *See also* ORE TREATMENT.

MINERVA, in Roman mythology, the goddess of wisdom, the same as the Greek ATHENA. She was said to have sprung from the head of JOVE, who, fearing that the infant about to be born would rival him, had swallowed her mother, Metis. Minerva was worshiped with Jove and JUNO in the temple on the Capitoline Hill, and had also a temple on the Aventine Hill, where she was worshiped as patroness of the fine arts and crafts. A five-day festival, the *quinquatrus*, was celebrated annually in Minerva's honor, beginning Mar. 19. The Palladium, stolen from Troy by the Greeks, was the goddess's image; it was later placed in the temple of Vesta. Minerva was also the goddess of battle.



THE MINERVA GIUSTINIANI IN THE VATICAN

MINES, when used by the Navy, metal cases, generally nearly spherical and containing explosives, anchored submerged to damage ships which come in contact with them in their antennae. Mine layers carry large numbers, but mines can also be laid from various other classes of ships including submarines. Though they can be to some extent guarded against by paravanes or removed by mine-sweepers, their extensive use in the World War was very effective. There are also floating mines. G. L. S.

MINE VENTILATION. Mine air contains a number of impurities; candles, lamps, and exhalations of workmen, introduce carbon dioxide; gasoline mo-



OUTSTANDING EXAMPLES OF MINIATURE PAINTING

1. "Henry III," by an unknown artist of the Clouet School, France. Late 16th century. **2.** "Augusta Temple Prime," by John Baptiste Isabey (1767-1855). **3.** "Colonel Sharpe Delany," by Robert Field (painted during the period from 1793-1819). **4.** "Martha Washington Greene," by E. G. Malbone (1777-1807).

tors discharge dangerous carbon monoxide; powder fumes, from blasting, contain several poisonous elements. The air is quickly polluted and its oxygen content materially lowered with improper circulation. Good ventilation is therefore imperative, especially in coal mines, where enough air must be circulated to dilute the explosive gases emanating from the coal.

The difference in temperature of the air without and within a mine produces currents of air. In many metal mines, especially those with open STOPES and with several outlets, this natural ventilation is sufficient. In others, power ventilation is required, a centrifugal fan forcing the air in one SHAFT and out another. *See also* EXPLOSIONS, DUST; SAFETY LAMPS; MINING, COAL; MINING, METAL.

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MINGO JUNCTION, a city on the eastern boundary of Ohio in Jefferson Co., situated 17 mi. north of Wheeling, W. Va., on the Ohio River and served by four railroads. Blast furnaces, rolling mills and a nut and washer factory are here. Good farms are in the vicinity. Pop., 1920, 4,616; 1930, 5,030.

MINIATURE PAINTING IN AMERICA. Portrait painting "in the little" became popular in America, as in Europe, in the 18th century and flourished for over a hundred years. Portraits in the large had been in increasing demand for a century past for the walls of the mansion houses of the Colonial aristocracy, but the miniature was an intimate document of delineation of the human countenance, on a scale small enough to wear on the person as a consolation or remembrance when the original was absent. The roster of Revolutionary officers might almost be taken from their miniatures. The earliest miniature known to have been painted in America was little more than a drawing on vellum, done in India ink and pencil by John Watson, c. 1715. About 1750 miniatures on ivory began to appear, set in snuffbox tops, watch lids and bracelets. But usually they were cased in an oval frame, intended to hang from a ribbon. The first which has been identified was a likeness of Mrs. Jacob Motte, set in a bracelet and painted by Jeremiah Theus. Philadelphia, a center of wealth and fashion, became the headquarters of many of the notable miniaturists. Among the first was Mathew Pratt; his miniatures of Judge Thomas Hopkinson and his wife, Mary Plumstead, and of Rebecca Pratt are the earliest real miniatures that have been preserved. Other painters were John Woolaston, John Hesselius, Benjamin West, who painted a self-portrait at 18, Robert Fulton, George Freeman, whose miniatures of Mrs. Nicholas Biddle and Mrs. Edward Biddle made him famous, Charles Saunders, George Catlin, James Lambdin and Thomas Barratt. Miniatures bearing the name of Peale to the third generation, of increasing dilution of merit, have appeared. Eight different members of the family have left signed miniatures. The last was Mary Jane Simes, a daughter of James Peale. Charles Peale, a captain of volunteers, noted in his diary that in his winter at Valley Forge in 1777 he painted no less than 40 miniatures of officers, including the Commander-in-Chief, then a young and handsome man, and the Comte de Rochambeau. He painted several other miniatures of George Washington, the last in 1795. At the same sitting, one was done by his son Rembrandt, who was the most creditable artist of the family. Thomas Sully produced 40 miniatures before he was 23, which in their elegant correctness are as fine as his large oil paintings.

In Boston the severity of Copley's careful, sober likenesses made him the favorite. His number of miniatures on ivory in oils is not large, but his portraits of Alexander Hamilton as a boy and Mrs. Paul Revere are miniature treasures to-day. He preferred small portraits of 3 by 6 inches. He left two charming miniatures in water color and two in enamels. After Joseph Dunkerley and Edward Savage, there was a lapse in the quality of miniature painting in Boston. Nevertheless there was painted at this time one of the most beautiful miniatures in the American history of the art. It was done by Gilbert Stuart as a demonstration for his pupil Sarah Goodridge, who was making a labored copy of a portrait of General Knox. Not only was a superb miniature of General Knox the result, but the pupil merited by the example and made several excellent miniatures of Stuart as an old man of 70. It has long been supposed that this was Stuart's only attempt at miniature painting, but several others have come to light. One of John Henderson, painted on a curiously prepared bit of canvas, bears Stuart's name on the reverse side; also credited to him is a small water color on silk of George Washington. New York with its cosmopolitan atmosphere attracted most of the artists of the day at some time in their career. Those most closely identified with this city are John Trumbull, whose best work was minute oil paintings on wood, William Dunlap, the Vasari of American art, Tisdale, John Jarvis, Matthew Jouett, Joseph Wood, Henry Inman, who painted Mrs. Alexander Hamilton as an old lady of 68, Anson Dickensin, John Dodge, Ezra Ames, Thomas Cummings, Ann Hall, the first woman to be elected to the National Academy, Alexander MacDougall and Nathaniel Rogers, one of the most fashionable miniaturists of New York. The early period may be said to have ended with Richard Staigg, who was successful in portraying self-assured and affluent middle age.

A number of accomplished foreign miniaturists were attracted to America and resorted to the common practice of moving from one city to another. They found all the sitters they required. Among the most notable were Robert Field, the best-known and most finished artist; John Ramage, who had a fashionable New York clientele, and who also painted George and Martha Washington; Walter Robertson, a number of whose excellent miniatures have recently come to light, including one of Washington done in 1794; Alexander and Archibald Robertson; Henri Elouis; G. L. Saunders; Louis Collas; Saint-Memin, who incorporated the newly invented photographic devices in his work;

Philip Peticolas; and William Birch, who did skillful enamel miniatures of Washington and Lafayette. Talented and accomplished as were these foreigners, the best miniature painting was done by native-born Americans, and reached its height in the congenial atmosphere of Southern aristocracy at Charleston. One of the earliest of these artists was Henry Benbridge, whose admirable work is often mistaken for Copley's; the flower of American miniaturists was Edward Greene Malbone, whose work stands with the best painters of Europe of that period. His exquisite portraits are eagerly sought as rare treasures, and for their pervading qualities of gallantry and good breeding. His close friend, the artist Washington Allston, said of him, "he had the happy faculty of elevating the character without impairing the likeness." Malbone was so zealously sought after and so sedulous in his work that his strength broke under the strain and he died at 30 after a career of only 12 years. Benjamin Trott, another miniaturist brilliantly dexterous and observant, never saw beneath the surface and in his 50 years of painting maintained that all his sitters were "just folks." Charles Fraser, a native of Charleston, spent all his life there except for short journeys to the North. He was trained for the law, which gave a high seriousness to his rare talent. He was a personal friend of Malbone and much of their work was done together.

The well-known daguerreotype of Daniel Webster dates from 1851 and was the death knell for the ivory miniature, which had made its first appearance just a century before. The photograph with its cheapness, accuracy, novelty and multiple copies was more suited to an aggressive democracy than the dainty and aristocratic art of the miniature. Only in the present generation has there been a genuine enthusiasm and appreciation of these fine creations of the past, which have made characters that have hitherto been only names to live again. There has also been a revival of miniature creation. In 1899 the American Society of Miniature Painters was organized, with rigorous conditions for membership. Among modern miniaturists who have done notable work are Alice Beckington, William Baer, Isaac Josephi, Lucia Fairchild Fuller, Margaret Hawley, Theodore Thayer, Laura Coombs Hills, Helen Turner, William Whittemore, John MacDougall and Virginia Reynolds.

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MINICONJOU, one of the tribes of the Teton division of the DAKOTA. They are most closely related to the Oglala, Hunkpapa and Brulé Teton. In the middle of the 19th century this warlike group roved over the Black Hills and the headwaters of the Cheyenne River. With other Siouan groups they are now on the Cheyenne River Reservation in South Dakota.

MINIM, a musical note which, as its name connotes, was formerly the shortest note in use and was written ◊. It now serves as the English name of the half-note and is written 𝅗𝅥. See NOTATION.

MINIMS, ORDER OF, a mendicant Order founded by St. Francis of Paula in 1435. The name of the Order is derived from the Latin *minimus* signifying least and indicates the humility of spirit and utter abasement of self required of the members of this Order. Those joining the Order are under vow also to abstain completely from eating meat and to engage themselves in practical assistance of the poor and abandoned. In 1931 22 monasteries of Italy contained members of the Order of Minims.

MINIMUM WAGE, the fixation, usually by law, of the lowest limit for WAGES within a given industry. Minimum wages in some form and for some wage earners are now applied in most industrial countries. In Australia and New Zealand they apply to workers in all trades, in Great Britain mainly to workers in unorganized trades and in agriculture, in the United States to women and minors only.

First set up in Australia in 1896 to abolish the SWEATING SYSTEM, they have been based upon three main principles: 1. The living wage determined by health and comfort budgets, the most common basis in the United States. 2. The fair wage determined by skill and comparison with similar trades, and 3. The wage the industry can bear.

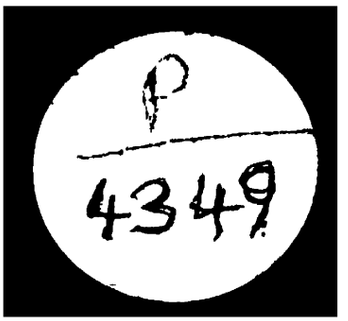
In the United States the first minimum wage law was passed in Massachusetts in 1912. By 1926, 15 states had such laws, usually applying to women and children in most industries. The Nebraska law was repealed 1919, that of Texas, 1921. Those of the District of Columbia, Arizona and Arkansas were declared unconstitutional by the U.S. Supreme Court, 1924, 1925 and 1926, respectively, on the ground of interference with liberty of contract. In consequence, the application of the laws has been greatly disorganized. Their compulsory application in most states has been restricted to minors, the laws regarding adult women being applied only through voluntary cooperation of employers. The constitutionality of the Massachusetts law, which relies upon public opinion for enforcement, remains unquestioned.

Opposition to the minimum wage came mainly from employers, the more conservative women's organizations, and in some cases from working women who feared the loss of their jobs. The American Federation of Labor has been lukewarm on the subject of minimum wages for women. Both the Federation and the courts, for different reasons, have opposed such a minimum for adult men.

It is generally agreed that the fixing of a minimum results in an increase in wage levels and living standards and in slightly higher prices and living costs.

P. F. B.

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